METHODS AND MACHINES FOR PRODUCTION

OCTOBER, 1944

The TOOL ENGINEER

Official Publication of
American Society of Tool Engineers

PUBLISHED BY THE BRAMSON PUBLISHING COMPANY

Are Your PRECISION GAGE BLOCKS *Still Safe to Use?*

All Precision Gage Blocks have one thing in common . . . they eventually wear. New blocks are made accurately within a few millionths of an inch. That is why you bought them . . . for use as dependable master standards.

But only a little wear on a few of the most often used blocks can change a whole set into a potential source of dangerous errors when you use these worn blocks to set the working gages that in turn govern your whole production accuracy. That is why we recommend periodic expert inspection of your Precision Gage Blocks . . . a sure way to safeguard the source of Accuracy for your whole inspection system.

Regardless of Where You Bought Them . . . The Answer is . . .

PRATT & WHITNEY INSPECTION of your PRECISION GAGE BLOCKS

Here is how it works . . .

1. Send your blocks to our factory at West Hartford, Conn., with an order to inspect them.
2. Each block is individually cleaned, and all burrs, bruises or scratches are carefully stoned.
3. Each block is inspected for flatness, parallelism and length in our constant temperature room by our gage experts, using our extremely sensitive measuring equipment.
4. Our exact readings on each block are listed in an Inspection Certificate, plus our inspector's recommendation of replacement when he finds any block so worn or damaged as to be unsafe for use.
5. This Certificate is returned to you.
6. You then instruct us to either replace dangerous blocks with new ones from our stock, or to return your set "as is."
7. If you instruct us to replace worn blocks we will do so at individual block prices, and return your set in first class condition.

In this vibration-free, constant temperature room Pratt & Whitney Grand Masters are checked and calibrated by an interferometer. Periodically these Masters are sent to the National Bureau of Standards for additional checking. Every gage block sent to P&W for inspection is individually checked against these Masters.

For full information on new sets of P&W Hoke and USA Precision Gage Blocks, write on your letterhead for the Pratt & Whitney booklet "± Millionths."

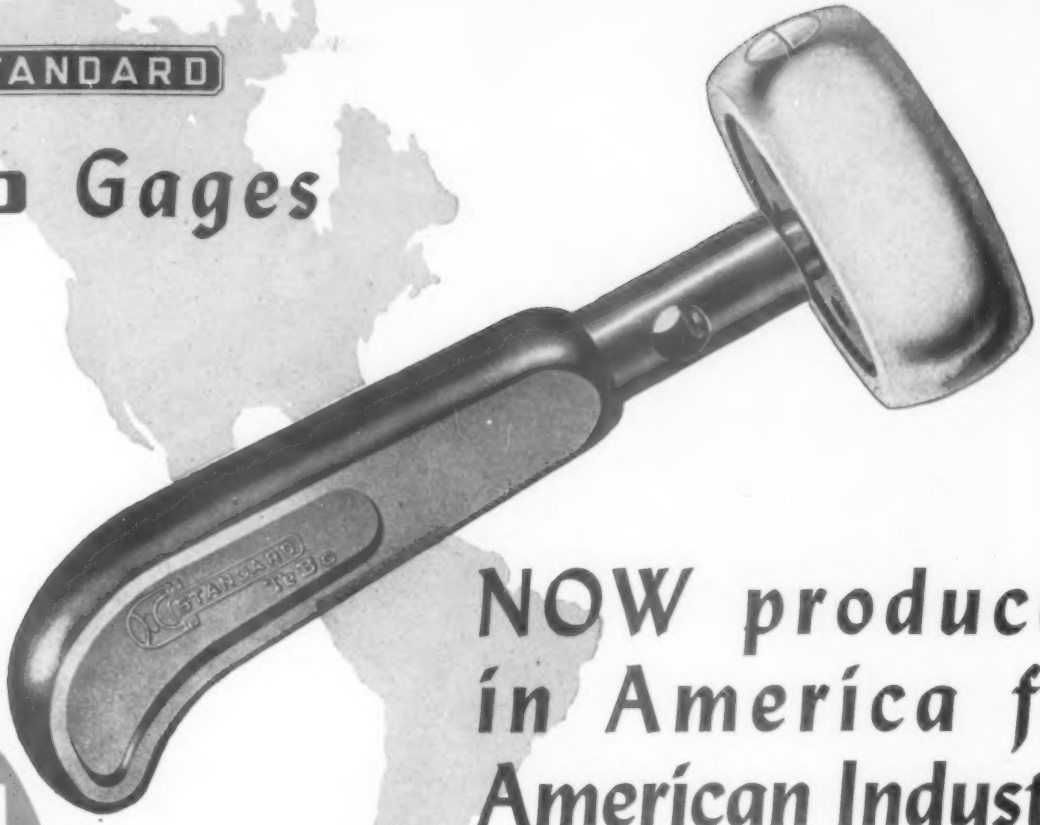
PRATT & WHITNEY

Division Niles-Bement-Pond Company

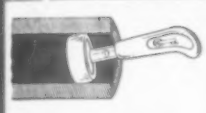
WEST HARTFORD 1, CONNECTICUT

STANDARD

TeBo Gages

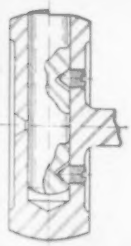


NOW produced in America for American Industry



ONE OPERATION
Checks Minimum and Maximum Tolerances

REVEALS BORE CONDITION AT ANY POINT



ADJUSTABLE FOR CHANGE OF TOLERANCES

Check Bores in ONE Operation More Accurately, 60% Faster Than Conventional Type Plug Gages

TeBo GAGES, long the favorite bore checking instruments of Swedish and other European precision workers, are now produced by Standard Gage Company. Considered by users the most desirable fixed limit type gage, TeBo can make a tremendous contribution to precision in American mass production. It performs, in one operation, the several functions required of plug gages, with an ease and accuracy that is a revelation to expert craftsmen.

With TeBo Gages, both minimum and maximum limits may be checked in one operation. They reveal the internal conditions of the bore at any point, indicating such factors as out-of-round, taper, belling, as well as dimensional deviations. They can be used with equal accuracy in soft as well as hard metals. May be used in thin walled bores without risk of distortion.

The chromium plated TeBo Gage head is a section of a true sphere, the ideal shape for internal gaging. It passes through a bore freely, without jamming or forcing. A spherical projection controls maximum tolerance measurements. Standard Gage has added adjustability to this projection by means of two ingenious set screws.

TeBo Gages are light in weight and precisely balanced. They minimize fatigue and may be used over long periods without strain. Their operation is so simple and direct and their findings so easily understood that major gaging operations may be entrusted to workers of slight technical skill. Users report savings up to 60% in gaging time through use of TeBo Gages.

WRITE FOR NEW TeBo GAGE BOOKLET

STANDARD GAGE CO., Inc., Poughkeepsie, N.Y.

the Difference

SOCKET SCREWS

√*Completely Cold Forged*

by HOLO-KROME

❶ SOCKETS, UNIFORMLY ACCURATE TO FULL DEPTH OF HOLE - TRUE HEXAGONAL SHAPE ACROSS FLAT SECTION DIAMETER IDENTICAL TOP AND BOTTOM - NO TAPER - SMOOTH REGULAR WALLS - WELL DEFINED CORNERS ❷ SMOOTH FLAT TOP WITH SLIGHT CHAMFER ❸ CONCENTRICITY OF HEAD WITH BODY ❹ CONTINUOUS FIBRES ENDING IN SOCKET WALLS ❺ REINFORCED SOCKET WALLS ❻ CONTINUOUS UNBROKEN FIBRES ❼ CONTINUOUS UNCUT FIBRES ❽ CONTINUOUS UNCUT LATERALLY DEFLECTED CORE FIBRES ❾ INCREASED STRENGTH ❿ SQUARE SHOULDERS ⓫ RADIUS FORGED, MACHINING UNNECESSARY ⓬ ORIGINAL CONTINUOUS FIBROUS STRUCTURE

FIBRO FORGED is the registered trade name of Holo-Krome Completely Cold Forged Socket Screws. The Holo-Krome patented method produces an obviously finer quality Socket Screw . . . A few of the many exclusive features of Holo-Krome Completely Cold Forged Screws shown above. Study them! Note particularly the continuous fibres running from end to end! Uninterrupted, unbroken, unsevered! That's Completely Cold Forging! And Completely Cold Forging is Holo-Krome.

FIBRO FORGED
TRADE MARK

√ METHOD PATENTED, OWNED, CONTROLLED AND EXCLUSIVELY USED BY HOLO-KROME.

THE **HOLO-KROME** SCREW CORP. — SOCKET SCREW PRODUCTS — HARTFORD 10, CONN. U.S.A.

VOLUME XIV OCTOBER, 1944 NUMBER 4

THE TOOL ENGINEER

T.M. REG. BY AMERICAN SOCIETY TOOL ENGINEERS

THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BOULEVARD DETROIT 2, MICHIGAN
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RALPH E. DAVIS, Presentation Editor

Publisher's Letter

WE believe a number of the 12 feature articles and 11 regular departments in this issue could provoke serious editorial discussion. But one in particular carries a message we believe it is our duty as editors and publishers to give wide circulation.

That particular article, "War Production Lessons Must be Learned Now", begins on page 74.

•

When war came, the United States was about as unprepared industrially as militarily. And because war production is so dissimilar from peacetime production, we may again be industrially unprepared when total reconversion comes.

Yes, we had "know-how" in the winter of 1941-42. But a lot of it was expended in revamping old equipment. Americans are proud of their ability to fix anything with a screw driver and a piece of fence wire. Is such thinking conducive to enterprise, to making the most of our ingenuity?

On "V-Day" the nation will own more than 100,000 surplus units of the most modern equipment, and machine tool builders will be prepared to deliver machines still more economical in operation.

•

Yet, many a works manager and master mechanic will lend an attentive ear to the department head who says, "I think I can fix up the old machine once more for this job." At that moment, a lot of precious engineering talent will be lost on a candidate for the junk heap.

The answer will be that there wasn't money to buy the new machine—at least it couldn't be justified. Isn't it probable that the money won't be there because it had been milked off through a process that condones "fixing up the old machine to do one more job"?

A company's depreciation period usually is not of greater length than the period owners intend to stay in business. Let's not be so shortsighted after "V-Day".

A leading production executive, speaking at our recent PRODUCTION Round-Table in Hartford, summarized our argument in his prediction of a changing outlook in New England industry.

"The ultra-conservative Yankees lost much of their textile industry to the South and their production leadership to the Mid-West because they continued to use uneconomical, antiquated machinery," he said. "The war has taught them a lesson. Now, many concerns here are buying any machine that will do the job cheaper and better."

•

Being industrially prepared for peace automatically results in preparedness for war. Both conditions can be very discouraging to war-minded nations.

Cordially yours,

Roy T. Bramson

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How many machine tool operations help to make him

the safest flyer in the world . . .

America spends more time, more money, more effort to protect the life of a flyer than any other country in the world . . . He is the unexpendable.

Into a single engine of his plane go as many as 84,000 individual manufacturing operations . . . to accuracies as fine as four-millionths of an inch.

And of all the machine tools in use by the aviation industry, none is more basic or more vital than the internal grinding machine.

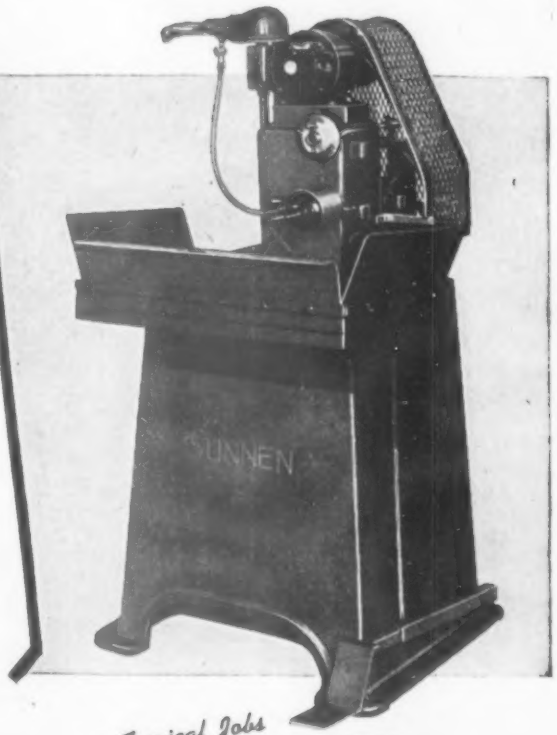
Bryant engineers have helped the men of government and of industry to plan the most desperate and gigantic production program of all time . . . and they can help those same men in planning today for the peace that must be won after the war is won!

We invite you to send for a Bryant man today.

BRYANT CHUCKING GRINDER CO.
SPRINGFIELD, VERMONT, U. S. A.

Consider These 9 ADVANTAGES of the Sunnen Precision Honing Machine for INTERNAL FINISHING

1. Hones and finishes internal cylindrical surfaces from .185" to 2.625"
2. Accuracy is guaranteed within .0001"
3. Produces a super-smooth finish
4. Used in ferrous or non-ferrous metals, plastics, ceramics, glass, etc.
5. Accurately duplicates sizes
6. Does not require skilled labor
7. Can be "set-up" for any size in one minute
8. No jigs or fixtures needed
9. Economical to operate

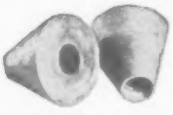


Some recent refinements add to the accuracy and efficiency of the Sunnen Precision Honing Machine. A new base and coolant pump has been added that provides a constant flow of honing fluid to the work. A machine light makes inspecting and gaging parts easier.

Yet, with all these advantages, the Sunnen Precision Honing Machine is low in cost. Let a Sunnen engineer give you complete information — or write for free catalog.

The coveted Army-Navy "E" waves over the Sunnen plant, evidence of the important part Sunnen equipment is playing in the war effort.

Typical Jobs



Cones for Wheel Balancing Machine "Accurately align hones two interrupted surfaces."

Saved time in producing a smooth, accurate finish on this bronze remote control valve body.

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Aircraft Valve Guide. Valve tappet roller pin hole honed to 6 micro inch finish.

Hydraulic Two-Way Control Valve. Hole is honed to eliminate leakage.

Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

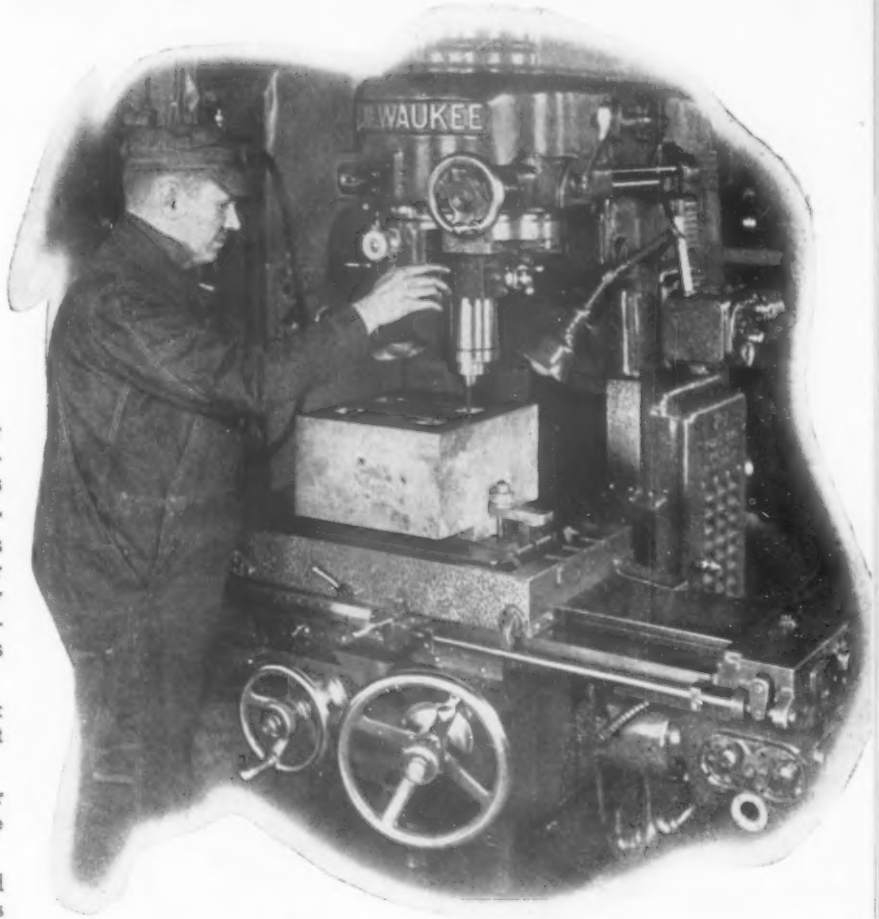
SUNNEN

SUNNEN PRODUCTS COMPANY • 7932 Manchester Avenue, St. Louis 17, Missouri

Canadian Factory: Chatham, Ontario

MAINE STEEL, INC. *Reports . . .*

"Greatest Time and Money Saver in Die-sinking Machinery in 25 Years!"



"You may remember that about a year ago you sold us a Rotary Head Die-Sinking Machine. We feel that it is time that we told you what we think of it.

The Rotary Head principle has saved us more time and money than any other improvement in Die-Sinking Machinery since Cherrying Attachments were invented more than twenty-five (25) years ago.

The principal reason is that we can sink four (4) impressions complete without moving the work on the table.

This saves three (3) setups out of four (4) when compared to a Rotary Table Machine.

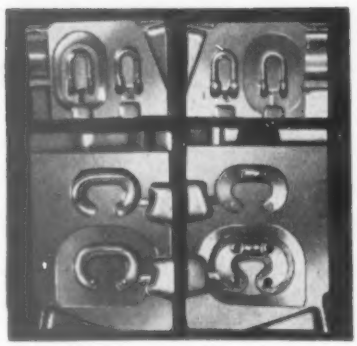
This saving would of course be increased where more than four (4) impressions are needed.

Besides this — the various movements built into this Rotary Head enable us to sink our dies without first laying them out on the Die Blocks.

The machine does its own layout work.

And after a year's experience we can say that these two features have averaged to save us over 30% of our die-sinking time.

Yours very truly,
MAINE STEEL, INC.
A. A. Rines
Foreman—Die Sinking Dept. "



This is typical of the forging dies produced by Maine Steel, Inc. The Milwaukee Rotary Head Miller has saved this firm over 30% in die-sinking time on dies of this type.

Kearney & Trecker's Rotary Head Miller is regarded by the majority of users as the most versatile machine ever designed for die and mold work. Direct — fast — accurate — it reduces initial job preparation and set-up time to the minimum — saves operator's time and assures rapid production of dies and molds. Write for Bulletin No. 1002C for full information on this unusual machine tool.

Rotary Head Milling Machine
•
Autometric Jig Borers
•
Center Scope

Kearney & Trecker *Products*
CORPORATION
Milwaukee, Wisconsin
Subsidiary of Kearney & Trecker Corporation

Milwaukee Face Mill Grinder
•
Milwaukee Midgetmill
•
Milwaukee Speedmill

First Aid for Ordnance

We salute the Unsung Heroes of Army Ordnance.

Machines of War wounded in combat can often be salvaged to fight again.

Each tank, each gun, each truck put back in service gives our offensive that much more punch . . . makes it possible to attack the enemy in more places.

Many times under fire while they work, Ordnance Field Units perform miracles of repair and restoration. Without thought of their personal safety, they fight the battle of First Aid for Ordnance.

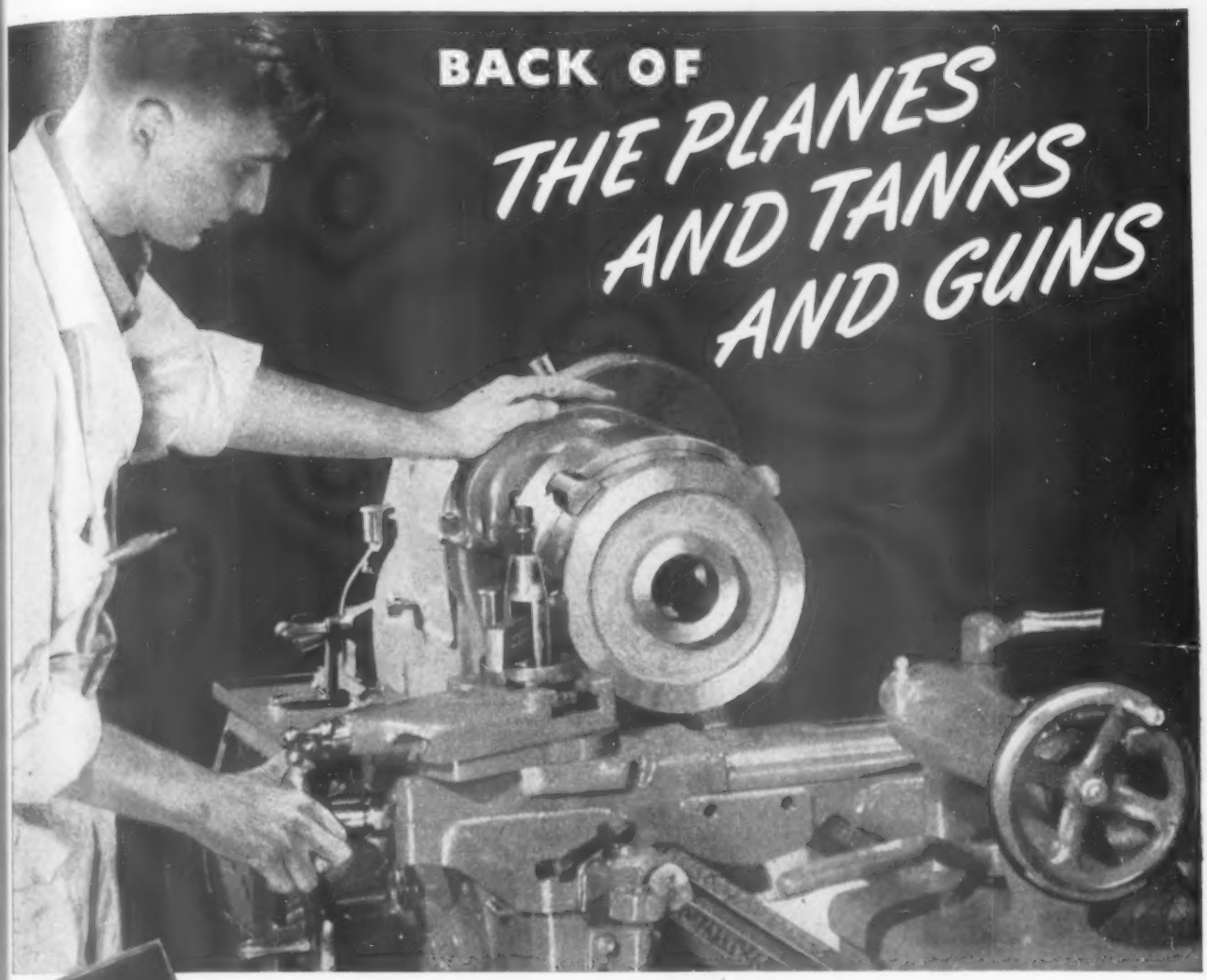
Yes, we salute these gallant Time Savers . . . Materiel Savers . . . LIFE Savers!

Back the Attack with War Bonds

QUALITY TOOL & DIE CO.

Manufacturers of "Quality" Products

401-15 NORTH NOBLE STREET, INDIANAPOLIS 2, INDIANA



All of the South Bend Toolroom Lathes, Engine Lathes and Turret Lathes are described in Catalog 100C. Write for a copy of this new, 48-page catalog.

Buy War Bonds!

Army-Navy Production Award With Two Stars

Back of the planes and tanks and guns that are flowing in ever-increasing quantities to our fighting forces is a skillfully coordinated plan of men and machines — a combination of skill, ingenuity and mechanical perfection that is going to win.

Accuracy is the key to the success of this great plan. Without the split-thousandth tolerances that assure perfect interchangeability of parts, the production goals could not be attained — and not enough planes and tanks and guns would reach the war fronts.

Capable of fulfilling the demands of urgent war production, South Bend Lathes have the accuracy and speed for the most exacting precision operations, plus ruggedness and power for efficient service.

South Bend Lathes are made with 9″, 10″, 13″, 14½″, and 16″ swings in both Quick Change Gear and Toolroom models. Practical attachments are available for special classes of work.

SOUTH BEND LATHE WORKS

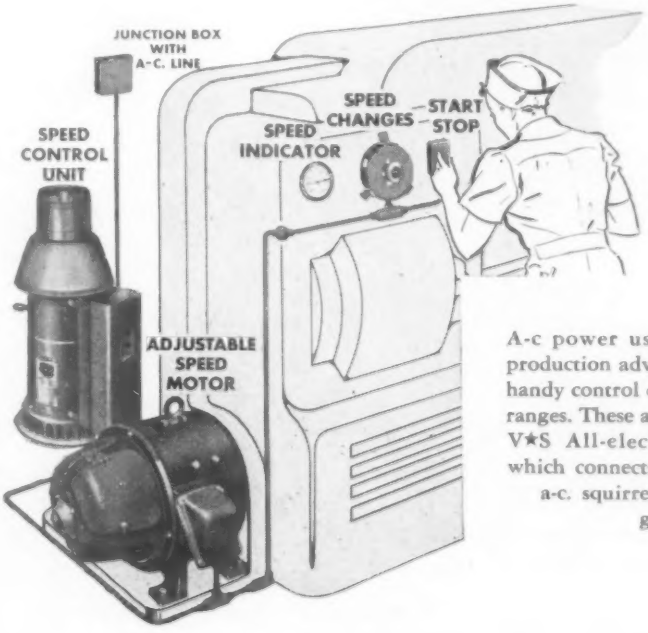
SOUTH BEND 22, INDIANA — LATHE BUILDERS FOR 37 YEARS

SPEED CONTROL

One of the big reasons for increased productivity of modern machines is speed control. This has been achieved in many cases by means of Reliance Motor-drive—efficiently, directly and eliminating gears, clutches, brakes and other mechanical go-betweens.

Besides control of speed and acceleration, Motor-drive can be the means of reversing, braking, remote control, tension control and tandem operation.

The possibilities of improved machine efficiency with properly applied Motor-drive are very great. Reliance engineers have done some interesting and resultful work in this field. Perhaps a review of them would produce some ideas profitable to you. Just phone or write our nearest office.



A-c power users can now enjoy all the production advantages gained with easy and handy control of operating speeds over wide ranges. These are obtained with the Reliance V★S All-electric Adjustable-speed Drive which connects to the same outlets as your a-c. squirrel-cage motors. For details get Bulletin 311.

RELIANCE A-C D-C MOTORS

RELIANCE ELECTRIC & ENGINEERING CO.

1088 Ivanhoe Road • Cleveland, Ohio

Birmingham • Boston • Buffalo • Chicago • Cincinnati • Detroit • Greenville (S.C.) • Houston • Los Angeles • Minneapolis • New York Philadelphia • Pittsburgh • Portland (Ore.) • St. Louis • Salt Lake City • San Francisco • Syracuse • Washington, D. C. • other principal cities.

Yours FOR THE ASKING...

A New Handbook *for Users of Taps*

Here for the asking is an up-to-date, practical shop handbook on taps and tapping, written for ready reference in the shop by foremen, superintendents and workers.

Opening with notes on the selection of the proper taps for the various types of work, the book contains complete tables covering Tap Fits; Basic Thread Dimensions and Tap Drill Sizes; Suggested Tapping Speeds, Lubricants and Approximate Angle of Cutting Face for Various Materials; and Tapped Hole Sizes. Other sections give information on Special Taps, Tap Usage and Sharpening Taps.

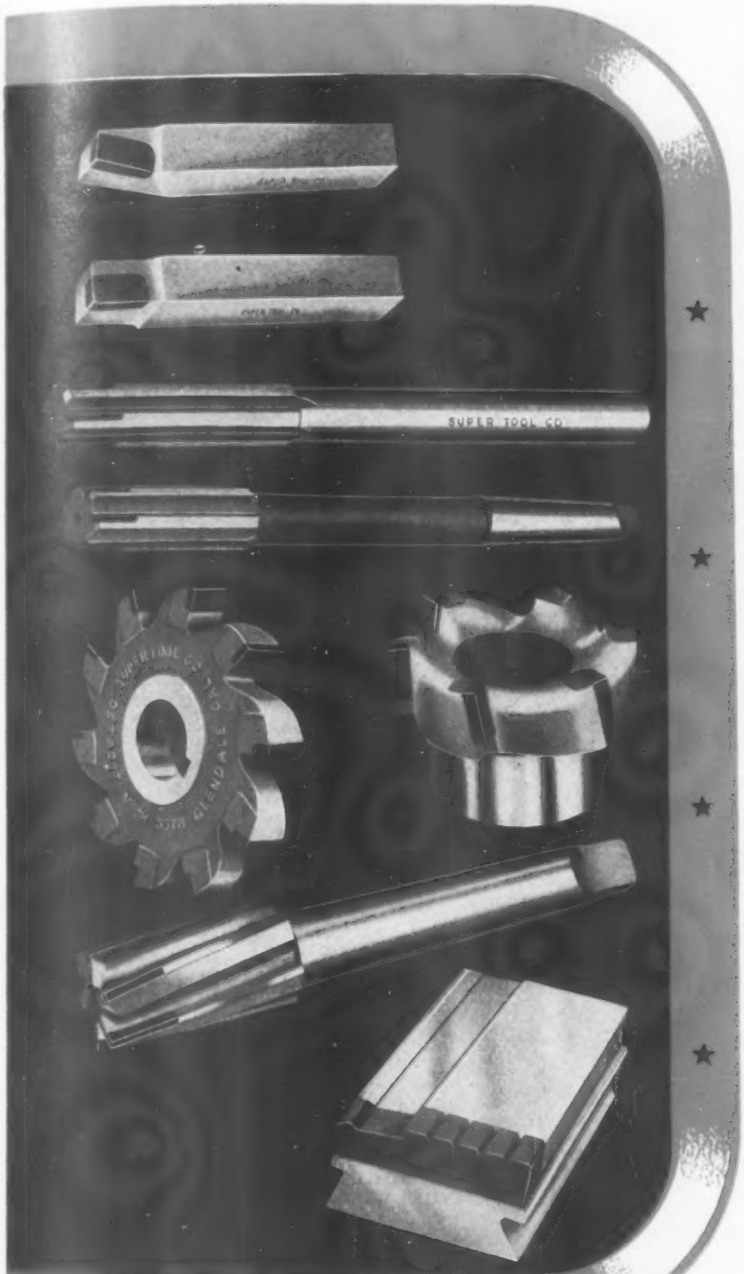
This handbook is just off the press—first copies are now available. Paper restrictions have made it necessary to limit the production of this manual—be sure to order at once to avoid possible disappointment.

CHARLES H. BESLY AND COMPANY
119 N. Clinton Street, Chicago 6, Ill.
Factory: Beloit, Wisconsin

BESLY
CHICAGO

BESLY TAPS • BESLY TITAN ABRASIVE WHEELS
BESLY GRINDERS AND ACCESSORIES

SUPER TOOLS...



FOR SPEED and ACCURACY ON EVERY CUTTING JOB

★ **CARBIDE TIPPED TOOL BITS**

For turning, boring or facing these single point tools are extremely efficient when machining all materials including hard steels. They cut fast, clean and true. Low heat absorption means less pitting when cutting soft steels.

★ **CARBIDE TIPPED STANDARD REAMERS**

These extremely fast, true and clean cutting solid type standard reamers are available with either a straight or tapered shank. They have proved their ability to hold their size over long runs on all types of reaming jobs.

★ **CARBIDE TIPPED MILLING CUTTERS**

For faster production, greater accuracy and money-saving economy on all types of milling jobs—cast iron and non-ferrous materials as well as steel. The low cost of these milling cutters permits their use on short as well as long runs.

★ **CARBIDE TIPPED SPECIAL TOOLS**

The wide experience of Super Tool engineers is backed by unequalled laboratory resources for creating special tools to meet your specific production needs. Super special tools are speeding production in hundreds of war plants. Send us your prints and specifications for recommendations and estimates.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

A UNIVERSAL GRINDER FOR TOOL ROOM SERVICE

Landis 12" LCH Hydraulic Universal Grinder

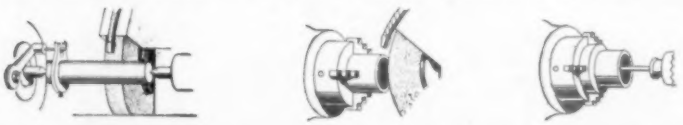
Simple to Setup
Easy to Change..

- Swivelling Headstock
- Swivelling Wheelbase
- Swivelling Worktable
- Adjustable Speed Headstock
- Hand and Automatic Wheel Feed
- Two Speed Hand and Power Work Traverse
- Removable or Swinging Type Internal Grinding Fixture

FOR A WIDE VARIETY OF JOBS

. . . mandrels, boring bars, jig bushings, dies, arbors—as well as production grinding.

CYLINDRICAL—FACE—INTERNAL GRINDING



The many flexible adjustments of the Landis 12" LCH Hydraulic Universal Grinder cut set-up time to a minimum and make it easy to change from one job to another.

Regardless of whether the grinder is used for tool room work, machine repair or production, it will remove stock rapidly, produce a superior finish and work to an accuracy of one part in ten thousand. For further information write for our engineering bulletin. 8A

PRECISION GRINDERS LANDIS TOOL UNIVERSAL RECOGNITION

LANDIS TOOL *Precision Grinders*

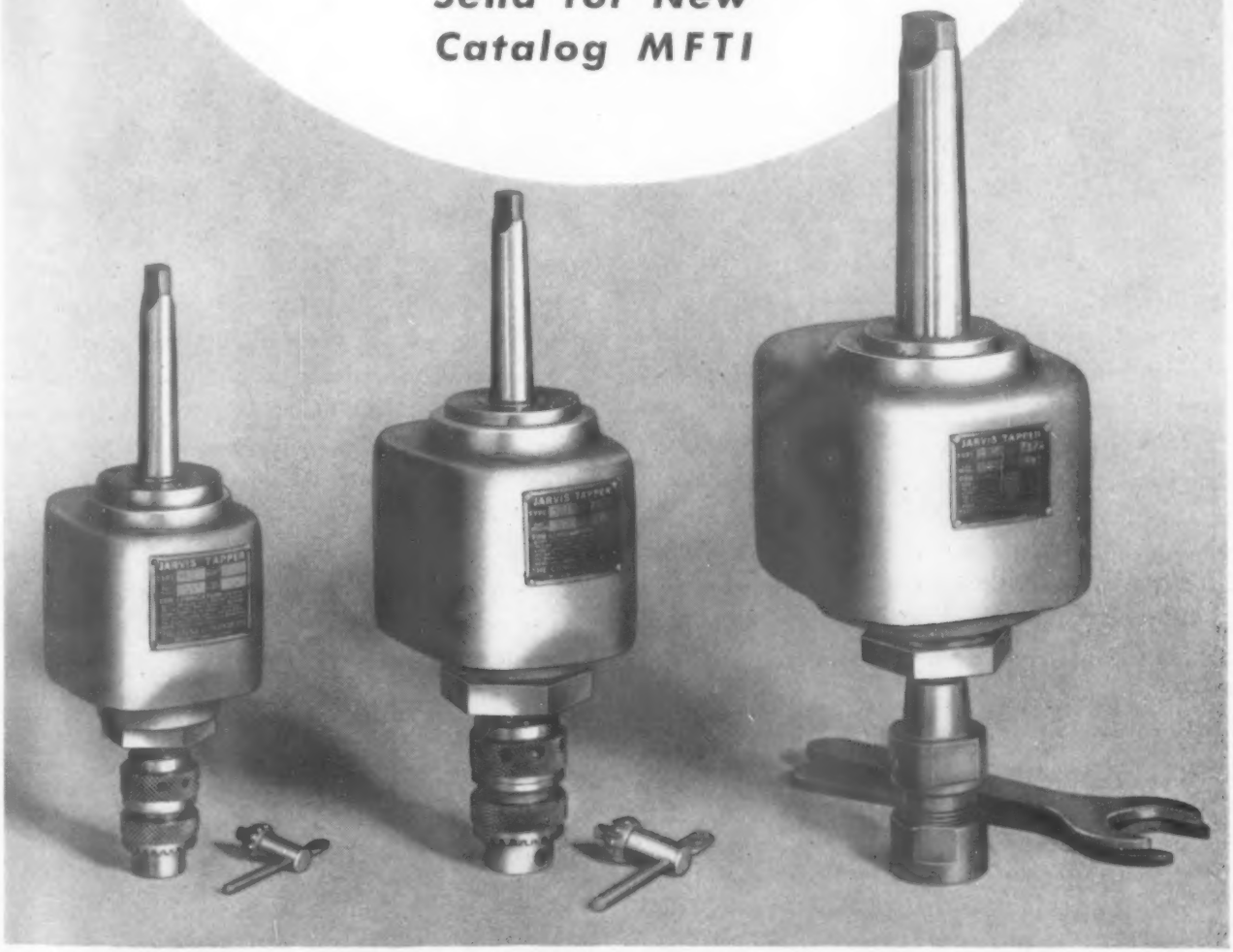
LANDIS TOOL COMPANY, WAYNESBORO, PA.

Jarvis High Speed Tapping Attachments

Jarvis Tapping Attachments are built for high speed production. Famous for long tap life and extreme accuracy, they will give dependable and efficient service.

When you use Jarvis High Speed Tappers, you save "time and taps".

Send for New Catalog MFTI

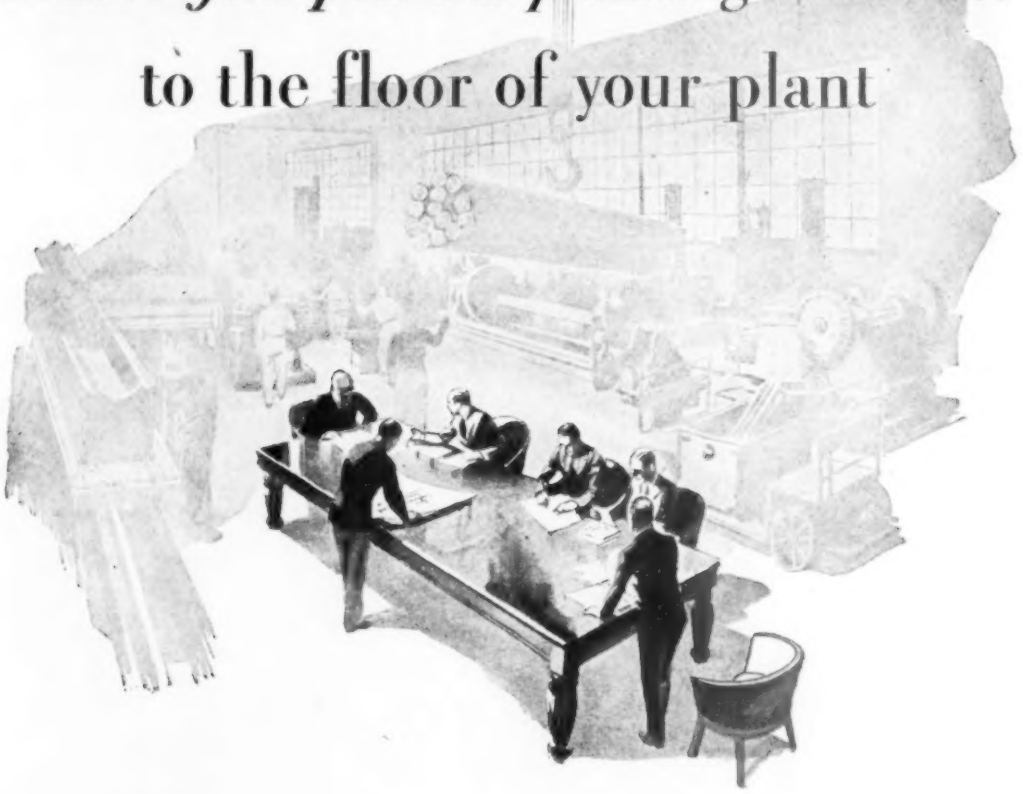


Jarvis POWER TOOLS

THE CHARLES L. JARVIS CO., MIDDLETOWN, CONN.

TAPPING ATTACHMENTS • FLEXIBLE SHAFT MACHINES • GROUND ROTARY FILES
QUICK CHANGE CHUCKS AND COLLETS

Move your post-war planning committee to the floor of your plant



Not literally, of course, but objectively. For there on the floor of your plant is the nucleus of the equipment on which your reconversion to consumer goods production will depend.

Few of the plans you conceive so carefully will have real meaning unless you take "physical inventory" of the condition of your present machine tools...unless you estimate how the stress of war production has impaired the efficiency of even those tools which were new just a few short years ago...take the first steps to restore their maximum efficiency and make them equal to their post-war job.

Reconversion-minded management in many of the country's leading plants are taking similar tours and initiating systematic programs of *Engineered Rebuilding* by Simmons Machine Tool Corporation.

For Simmons engineers bring to a rebuilding problem thirty-five years of specialized experience with *every* type and size of machine tool. Their proven techniques are behind the assurance that prematurely old machines can be restored to their original efficiency or new utility "built-in" beyond the originally designed intent.

Simmons methods have converted planers into hydraulic grinders, doubled the capacity of planers, converted entire plants from belt-driven tools to individual, self-contained motor driven units, lengthened beds and tables, widened housings and provided special motors and gear transmissions and other labor-saving devices.

Engineered Rebuilding can play a major part in setting up your new production line. And it's not too early to add it to your reconversion "musts." Start today by sending us a list of the machines you need rebuilt... those which can be "furloughed" from their war production jobs. We'll show you how "The Simmons Way" can facilitate your program.

President

SIMMONS MACHINE TOOL CORPORATION
1810 NORTH BROADWAY, ALBANY 1, NEW YORK

SIMMONS *Engineered* REBUILDING

Chuck never did stop "scouting" —for you

IN civilian life Chuck worked hard for your Industrial Supply Distributor. Perhaps you didn't know it then—but many a time it was his hard, persistent scouting for scarce materials and supplies that helped you to keep your production going.

Then Chuck put on the Uniform—but he never did stop scouting for you. Today he is up there in the sky, but when it's over he will be back with your Industrial Supply Distributor—with new ideas for helping you still more.

Give your Distributor every opportunity to help you. Particularly nowadays, channel every order you possibly can through him instead of sending direct to the factory. Twenty orders to the Distributor can be cleared in *one* order to the factory—will be delivered in most cases from stock with less paper work and less congestion on overcrowded rail and trucking facilities.

For your own and *everybody's* benefit—

Telephone your I S D FIRST!

C

ARMY NAVY

ARMY E NAVY

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
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"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

How Good Is Your Score On These Questions?

Test your knowledge of tool steel selection and heat treating

The questions listed below come up frequently in every tool room. The right answer makes possible longer tool life, fewer shut downs for re-grinding and greater safety in hardening. The wrong answer costs money through short tool life, production shut downs and greater tool costs.

See if you can select the right answers. Pick the correct one (A, B or C) and check your answers against the list printed in the box at the bottom of the page.

1 —**You should use a *tough-timbre* water-hardening high carbon tool steel**

- ☐ A—For dies with intricate shapes and thin sections
- ☐ B—For a wider margin of safety in hardening
- ☐ C—For tools that require red-hard properties

2 —**When straight carbon tool steel is not tough enough for a job requiring maximum hardness**

- ☐ A—You draw it below C-60/61 Rockwell
- ☐ B—You go to a high speed steel
- ☐ C—You use a .50% carbon silicon-molybdenum water-hardening steel (Carpenter Solar)

3 —**The most useful characteristic of an oil-hardening tool steel is**

- ☐ A—It hardens with a hard case and a tough core
- ☐ B—Safety in hardening and freedom from size change
- ☐ C—Furnace atmosphere does not affect surface hardness

4 —**To increase the toughness of high speed cutting tools**

- ☐ A—Draw at 900°F. for 8 hours
- ☐ B—Quenching in oil instead of cooling in air
- ☐ C—Draw at 1050°/1100° F. for two hours

5 —**The ability to produce a fine grained case and tough core over a wide range of hardening temperatures is an indication of**

- ☐ A—The analysis of the steel
- ☐ B—A low drawing temperature
- ☐ C—Tough-timbre quality tool steel

6 —**Hot acid disc inspected tool steel is insurance against**

- ☐ A—Freedom from decarburization in heat treatment
- ☐ B—Minimum of internal defects
- ☐ C—Excessive size change in hardening

7 —**In order to get maximum wear resistance in a water-hardening tool steel you use**

- ☐ A—A high carbon-tungsten steel (Carpenter K-W)
- ☐ B—You heat treat from a lower hardening temperature
- ☐ C—You quench with fresh water

8 —**To help prevent cracking or splitting of hot forging tools**

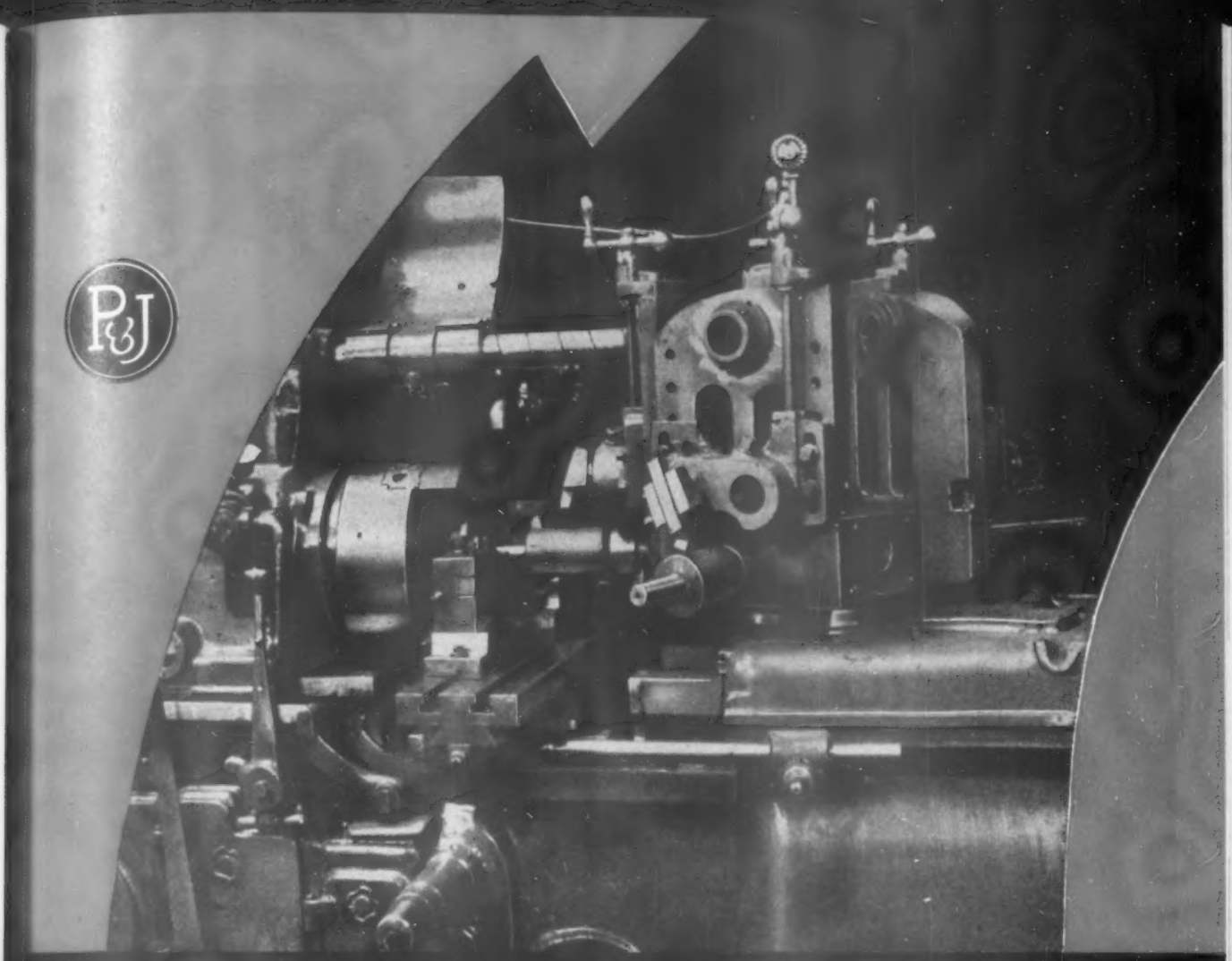
- ☐ A—Use a lower forging temperature
- ☐ B—Water cool the dies during operation
- ☐ C—Always preheat tools before putting in service

Did you score 100%? Getting the right answers to your tool steel problems is considerably easier when you use the Carpenter Matched Set Method. In addition to simplifying the selection of the right steel for any type of tool—complete and detailed heat treating instructions are supplied by Carpenter to assure best results. Full information to answer these and other tool steel questions is given in the Carpenter Matched Tool Steel Manual. (Free to tool steel users in the U. S. A.) A request on your company letterhead stating position or title will start your copy on its way.

CORRECT ANSWERS	
1.	B
2.	C
3.	B
4.	A
5.	C
6.	B
7.	A
8.	C

Carpenter MATCHED TOOL STEELS

The Carpenter Steel Co., 122 W. Bern St., Reading, Pa.



RE-TOOLING . . . MAKES PRESENT P&J EQUIPMENT AVAILABLE FOR NEW WORK

Looking back to '41

The original tooling on this smaller 4-D P&J Automatic was designed for quick set-up and close tolerance fast machining of bearing cages. Floor to floor time was 3.27 minutes, a performance that even then would compare favorably with today's fast tempo on similar work.

Looking ahead . . . to New Work

P&J engineers have invariably anticipated future trends in the design of P&J equipment. By making *versatility* in tooling an inherent characteristic, they have provided for a wide latitude in changeover possibilities to meet future requirements. It is for this reason that P&J Automatics can be readily converted to handle new work by RE-TOOLING. It means that your present machines may be entirely adequate for the jobs that lie ahead.

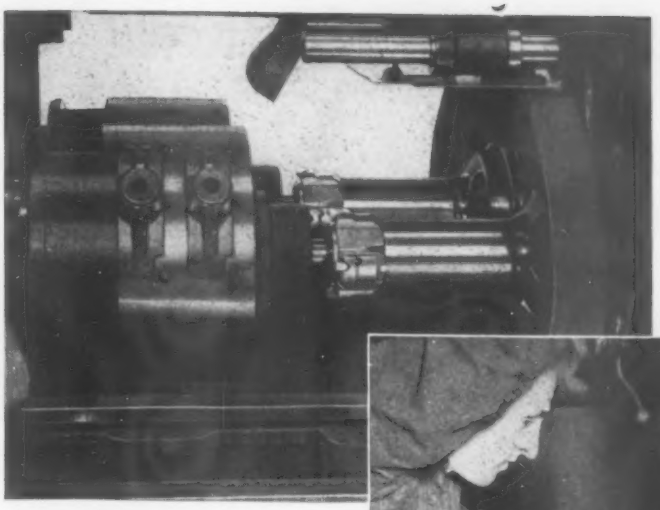
Now is an opportune time to know for a certainty just what P&J RE-TOOLING can offer you. We have the experience and facilities to help you take fullest advantage of the *versatility* in which you invested when you installed P&J Automatics. You are invited to call on us for our assistance in meeting tomorrow's problem through P&J RE-TOOLING service.

POTTER & JOHNSTON MACHINE CO., *Pawtucket, R. I.*

OUR BOYS
***are buying* BONDS *and* FIGHTING**

P&J REBUILDING SERVICE

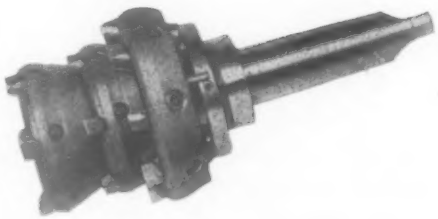
The service life of P&J Equipment can be reclaimed and extended with original accuracy and performance restored by rebuilding. P&J has set up a RE-BUILDING SERVICE in its plant which is available to present owners of this equipment. It will pay you to investigate and to have your machines retooled when they are rebuilt.



Special

LOVEJOY BORING HEADS

USE MANY STANDARD PARTS THAT LOWER COSTS ALL DOWN THE LINE



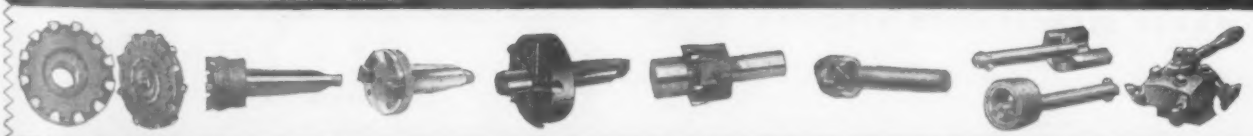
Users of Lovejoy Boring Heads appreciate the Lovejoy designs which incorporate standard parts wherever possible. This attention to detail pays off all down the line—first cost is low—maintenance costs are low—there is no need to carry expensive stocks of special parts—standard parts are available out of Lovejoy's stock the day the order is received.

All Lovejoy Boring Heads use famous Lovejoy positive-locking blades. These guarantee free cutting qualities and remove stock under coarse feeds with a minimum of power consumption—they cannot loosen even under intermittent cuts in deep holes.

When two or more heads are mounted on the same bar for roughing and finishing, or for multiple diameter cuts, the Lovejoy split tapered bushing mount is a time and labor saver. Complete details will be sent on request.

Lovejoy

TOOL COMPANY, Inc., SPRINGFIELD, VT., U.S.A.



MILLING CUTTERS | BORING HEADS | ARBORS | SPOT FACING TOOLS | COUNTERBORES | BORING BARS | SINGLE POINT TOOLS | TURRET TOOL POSTS

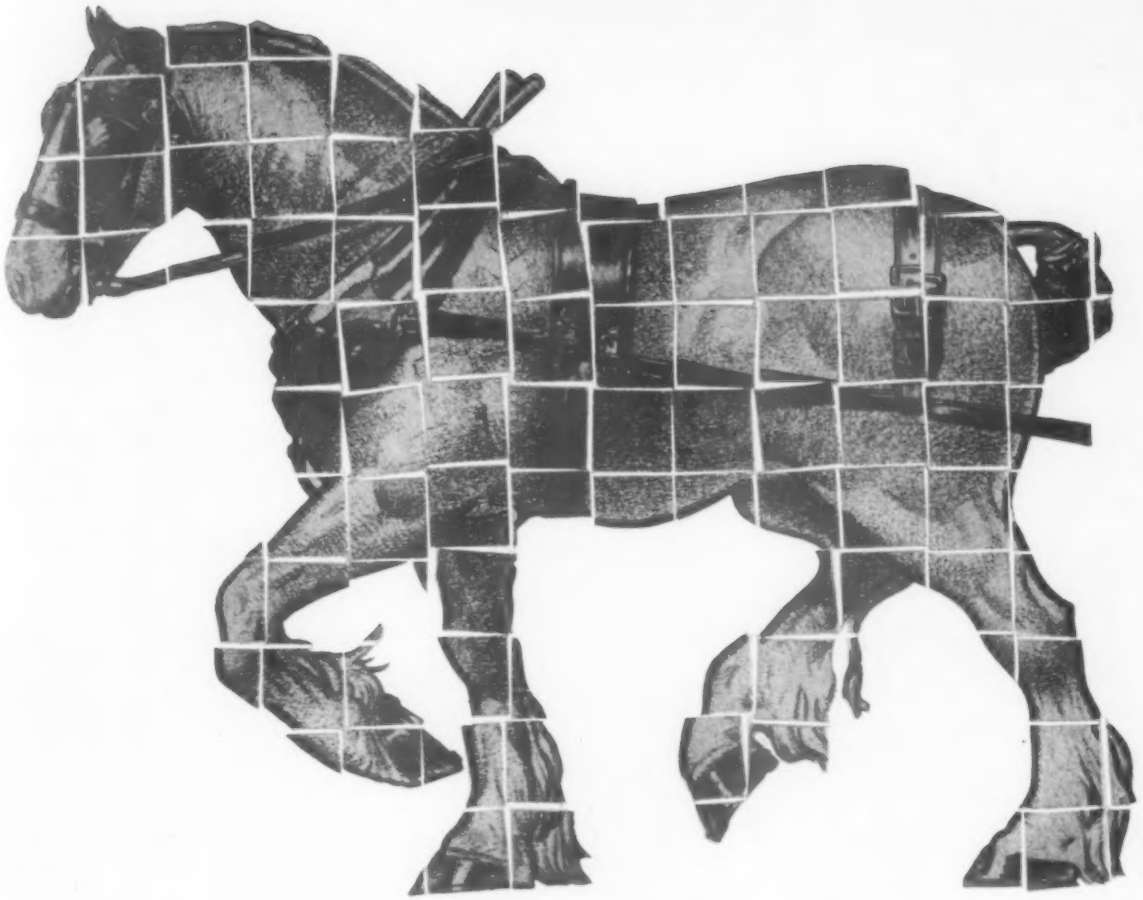
You'll make it right
if you hold it right

TOOLING for the many unusual machine problems presented by ordnance parts production has emphasized the exceptional versatility of standard Cushman Chucks when equipped with two piece jaws and soft blank top jaws, or with slip jaws, as in the case of the chuck shown above. It is an easy matter to machine such jaws to efficiently and safely hold odd shaped work pieces. When the nature of the work to be handled changes, it is only necessary to change the top jaws or slip jaws for the new piece. In many cases such a procedure saves the time and cost involved in making special face plates, jigs or fixtures. Chuck bodies can be used for a wide variety of tooling set-ups.

If you have a work holding problem in your present production or are now planning tooling for future production, we suggest that you consult the Cushman Engineering Department. Write to The Cushman Chuck Co., Hartford 1, Conn., U.S.A.

A WORLD STANDARD FOR PRECISION

CUSHMAN CHUCKS



James Watt's **horse** has been divided into 100 parts

For centuries "One Horsepower" had meant simply the work that one horse could do.

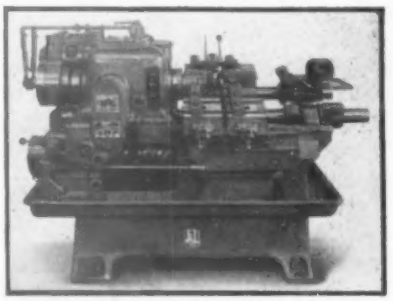
Then, 175 years ago, James Watt gave the term its modern meaning when he borrowed a husky dray horse from an obliging brewer and put the animal to the test. By means of tackles and weights, and some paper work, he determined that the horse could raise 1000 pounds at the rate of 33 feet per minute. So we got our familiar equation, ... 1 horsepower = 33,000 foot pounds per minute.

This was a lot of power—ideal for draught work—useless for the smaller, more tedious tasks such as operating a razor, a needle, a fan or an egg beater. Only a visionary would have thought of this.

But, the advent and development of electrical power condensed Watt's horse and divided him into a hundred tiny fractions. Power far greater than his is now packed into less than a cubic foot, and fractions of him fit neatly into the palm of your hand.

Tomorrow, these tiny, useful fractions of horsepower will take over more and more of our trivial, but tedious, work. For, today, men with ideas have the help of the makers of modern, fast, accurate machine tools.

For over a century, Jones & Lamson engineers have been helping our most progressive manufacturers to put their newest ideas into profitable production. This accumulation of experience and knowledge is at your service today.



A Jones & Lamson Fay Automatic Lathe tooled to machine the frame for a small electric motor. Fay Automatic Lathes are used extensively to machine parts for all kinds of domestic appliances, that add to our comfort and lighten our work.

JONES & LAMSON
MACHINE COMPANY
Springfield, Vermont, U.S.A.

Profit-producing Machine Tools

Manufacturers of: Universal Turret Lathes • Fay Automatic Lathes • Automatic Double-End Milling and Centering Machines • Automatic Thread Grinders • Optical Comparators • Automatic Opening Threading Dies and Chasers.

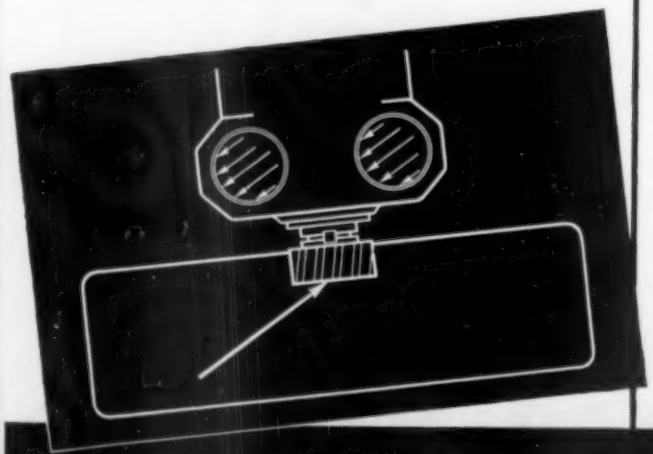
Balanced load!

Kent-Owens No. 1-14 Milling Machine with improved Hydraulic Control. Table 32"x9" table travel 14".

Exclusive
MOUNTING BETWEEN TWO POSTS

Only Kent-Owens Milling Machines are designed with the head mounted on twin posts—assuring balanced load in either direction. There is no overhang and no cocking action. The head is mounted on two cylindrical ground steel posts which carry the spindle midway between them. Shop men like its performance—an unusually rigid and accurate machine, practically chatter-proof for either direction of table travel. Send for bulletin.

KENT-OWENS MACHINE COMPANY... TOLEDO, OHIO



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KANSAS CITY
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LOS ANGELES
Eccles & Davies Machinery Company
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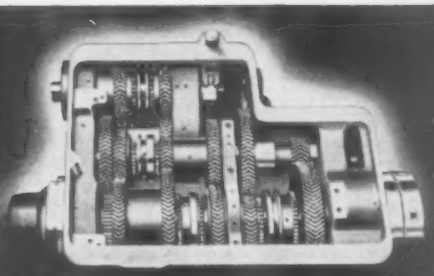
Call on KENT-OWENS *for Milling Machines*

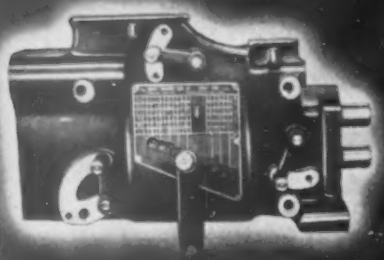
RIGID BED CONSTRUCTION



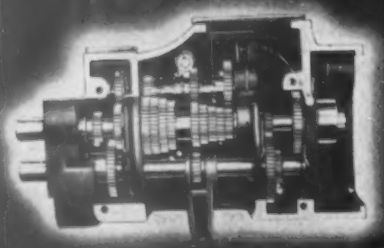
CONTINUOUS TOOTH 30° HELIX HERRINGBONE GEARED HEAD

Sidney

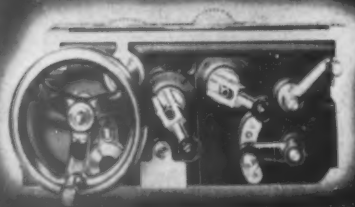
40TH ANNIVERSARY



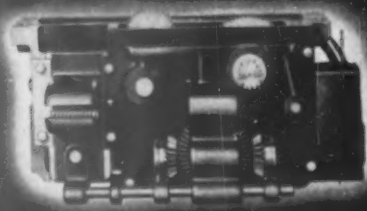
FRONT VIEW OF GEAR BOX



REAR VIEW OF GEAR BOX



FRONT VIEW OF DOUBLE WALL APRON



REAR VIEW OF DOUBLE WALL APRON

SIDNEY COMPOUND REST

Courtesy of Spencer Lens Co.

A battery of SIDNEY LATHES *on* PRECISION PRODUCTION

The fine tolerances required in machining parts for optical instruments is being accomplished on this battery of Sidney Lathes.

The inherent rigidity—the continuous tooth Herringbone Geared Head—the wide range adaptability of Sidney Lathes provides both the accuracy and flexibility of production necessary at this plant.

You can depend on Sidney Lathes for greater production—closer tolerances—and exceptionally fine finish.

Full descriptive bulletins on all sizes available

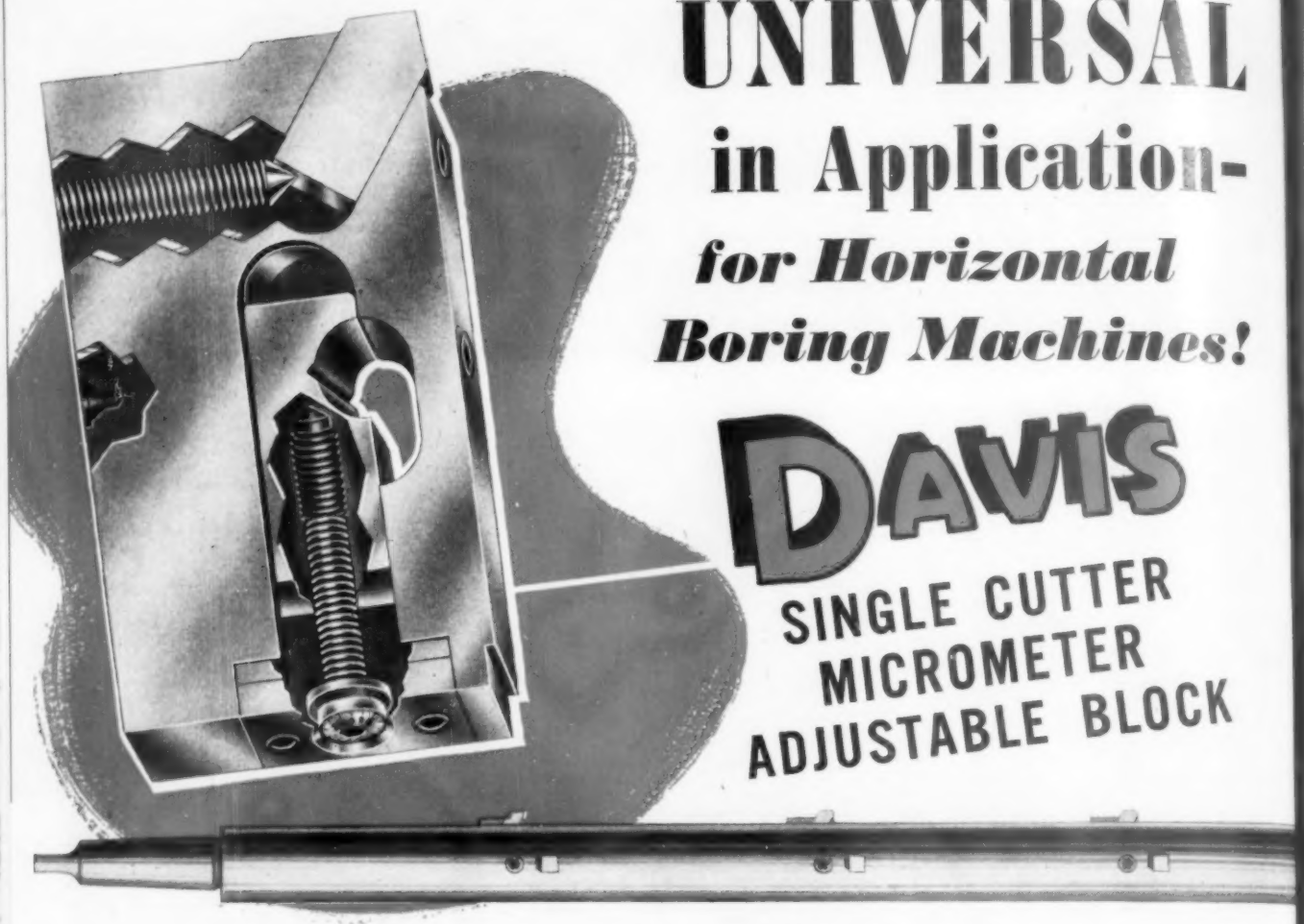
SIDNEY

The SIDNEY MACHINE TOOL *Company*

Builders of Precision Machinery

SIDNEY ESTABLISHED 1904 OHIO

UNIVERSAL in Application- *for Horizontal Boring Machines!*



DAVIS

SINGLE CUTTER MICROMETER ADJUSTABLE BLOCK

This time-tested DAVIS Block is designed chiefly for line boring bar practice, where rigidity and a wide range of cutter adjustments are the main requisites.

The DAVIS Single Cutter Micrometer Adjustable Block Provides:

1. Suitable size blocks and cutters with wide range of adjustment. Furnished in sizes from 2½" to 17".
2. Exclusive and accurate means of adjusting and setting cutters to size. Adjustable in .001 of an inch.
3. Block and cutter adjust as a unit, insuring full cutter support at all settings.

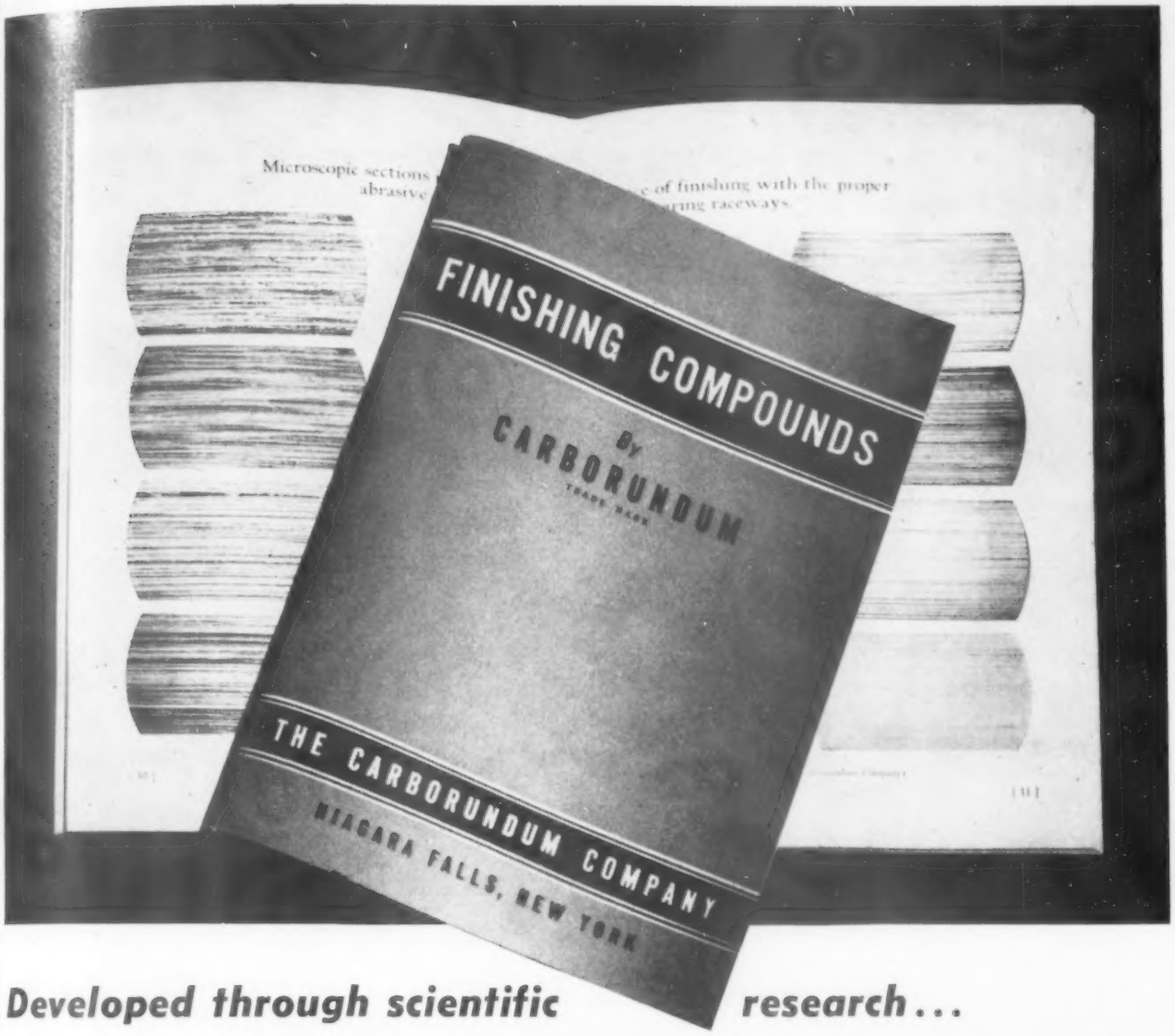
Write Today for Descriptive Bulletin No. 600

This DAVIS block provides an efficient and economical set-up for rough, semi-finish and finish boring, also special undercutting and forming operations. It is also suitable for use in Davis bars with standard-sized block slots.

Davis Boring Bars designed specially for customers requirements.

DAVIS
BORING TOOLS

DAVIS BORING TOOL DIVISION
LARKIN PACKER COMPANY, INC., ST. LOUIS, MO.



Developed through scientific research . . .

FINISHING COMPOUNDS BY CARBORUNDUM

There was a time when the use of lapping mixes was pretty much a hit or miss proposition. The preparation of mixes was the result of individual judgment—there were no scientific methods used in the proper compounding of abrasive grain with oil or other carrier media.

But now Carborundum research has substituted science for guess work. Today, finishing compounds by Carborundum are the result of a close scientific study of the proper combining or mixing of abrasive grain and carrier—the development of carriers for specific finishing applications—the accurate grading of abrasive grain—the correct type of abrasive.

These compounds are produced in various grades to meet all conditions. Grit ranges are from 60 down to 1,000, the extremely fine powders being produced under microscopic control.

They are made with four types of abrasives—Carborundum Brand Silicon Carbide, Aloxite Brand Aluminum Oxide, the natural abrasive garnet and the diamond.

For complete details regarding various grades—correct application and lapping procedure send coupon today for new free booklet "Finishing Compounds by Carborundum".

The Carborundum Company,
Niagara Falls, N. Y.

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Please send my free copy of "Finishing Compounds by Carborundum":

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(Carborundum and Aloxite are registered trade marks of and indicate manufacture by The Carborundum Company)

They're Cutting Sanding Time 83% with SKILSAW BELT SANDERS

AT DURAMOLD DIVISION OF FAIRCHILD ENGINE AND AIRPLANE CORP.

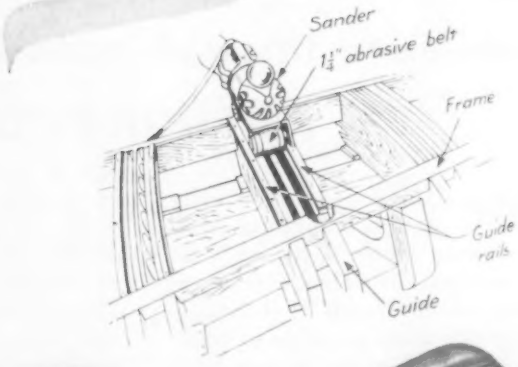
DURAMOLD Photo shows SKILSAW BELT SANDER in jig which won suggestion award for the designer, Albrecht Halbig.

A former 3 to 4 hour job for 2 men is a ONE HOUR JOB for ONE MAN with a SKILSAW BELT SANDER in a special jig

Stepping up finishing work on aircraft stabilizer frames is just one more example of how SKILSAW BELT SANDERS *do more jobs better!* In or out of a jig, on any flat and on many curved surfaces, SKILSAW BELT SANDERS do a cleaner, ripple-free finishing job faster and easier.

They pack plenty of power for round-the-clock production. They're light in weight, streamlined, handle easier in any position. And there's an extra measure of quality features in every SKILSAW BELT SANDER to give you low-cost operation longer.

If you work with wood, plywood, compositions or metal, find out the many ways SKILSAW BELT SANDERS can save time, money and manpower in your plant. Your distributor will show you on your own work. Phone him today.



4 models, belt widths 2¼, 3 or 4½ inches

SKILSAW, INC.
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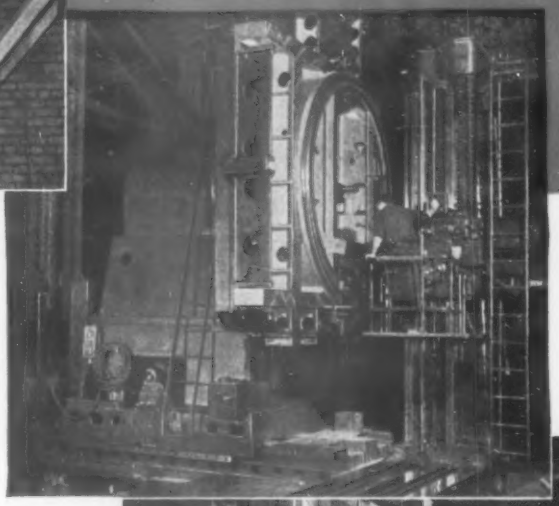
SKILSAW PORTABLE ELECTRIC TOOLS
MAKE AMERICA'S HANDS MORE PRODUCTIVE

PRODUCTION MILLING and BORING OF *Large Weldments*

(*Above*) Right angle attachment in position for milling surfaces perpendicular to the face of the weldment. Rotary table feeds work into cut and indexes weldment between cuts.



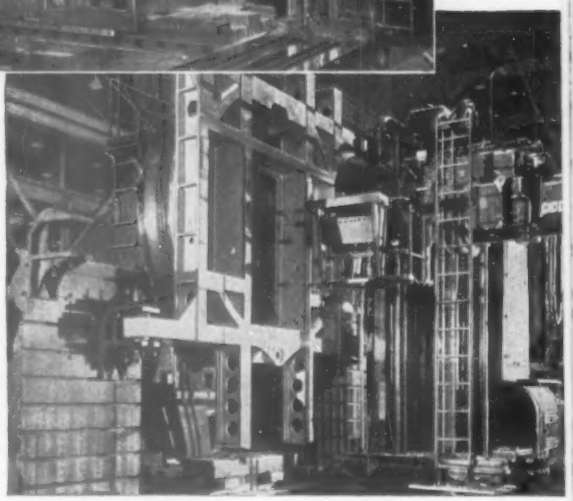
(*Right*) Weldment mounted on vertical table while milling a circular surface, interrupted by a protrusion, turning others, milling and boring. (Note portable table control on parking bracket.) Table is provided with power feeds and rapid traverse both for rotation and positioning on runway.

...ON A HORIZONTAL BORING MACHINE

● The shape and size of work to be machined often determines the size and shape of the machine designed to do the work... particularly when a special machine is required to handle the job. Here, however, is an interesting example of tooling standard horizontal boring, drilling and milling machines for production machining of huge weldments.

The basic machines used are three standard G. & L. Floor-Type Machines. Each is provided with a special rotary table which in turn carries a work-holding fixture. By routing the weldment over four machines, each performing different operations, production is quadrupled, greater accuracy is obtained and handling of the cumbersome weldments is simplified.

This is only one of many installations wherein G. & L. engineers have assisted in finding a practical solution to a special production problem. They will be glad to work with you in a similar capacity on any of your horizontal boring machine problems. Call upon them without obligation.



(*Above*) Weldment mounted in vertical position for milling back surface. Milling is performed using headstock feed and longitudinal feed of the column on the runway, and positioning the rotary table in and out on its runway.

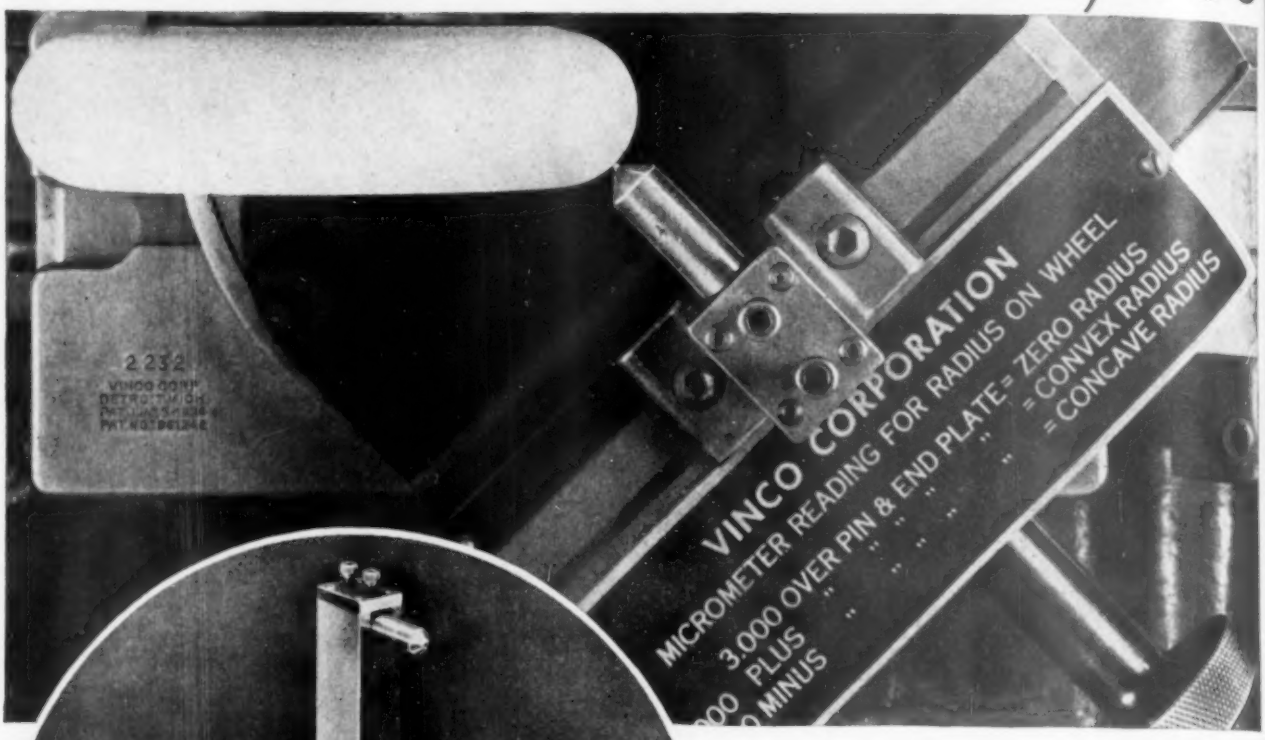
Additional Data

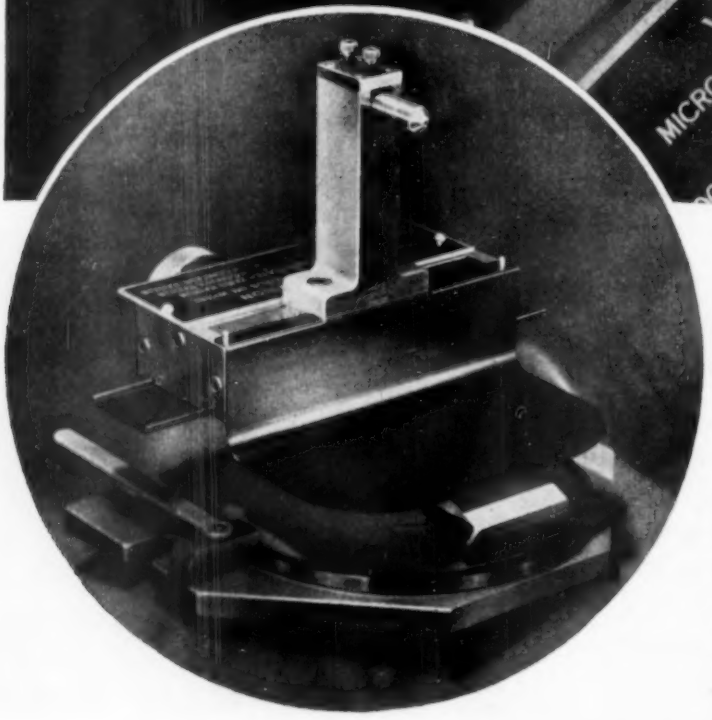
...covering the complete line of Giddings and Lewis machines and time-saving accessories is included in this catalog. Write for your copy today—please indicate your business connection. Ask for Bulletin No. TE 104.

GIDDINGS & LEWIS MACHINE TOOL CO.

132 DOTY STREET, FOND DU LAC, WISCONSIN

THERE ARE OTHER ANGLES, TOO





Sub bases will be furnished (at slight additional cost) for most types of external and internal grinders. When ordering, specify the machine or machines on which the dresser will be used. This will enable us to advise you correctly on the type of base best suited to your specific needs.

The opinion of men who are using the VINCO Model B-1 (Angle Tangent to Radius) Dresser daily—that is an important angle—the shop superintendent who can see increased production and cleaner grinding—the foreman who can charge minutes instead of hours to wheel dressing when computing labor costs—the cutter grinder who can now dress a wheel to the job instead of re-chucking the job to fit the wheel—these are a few of the personal angles that are largely responsible for the rapid increase in the VINCO B-1 Dresser acceptance. Write us direct or consult our District Sales Offices for any further information.

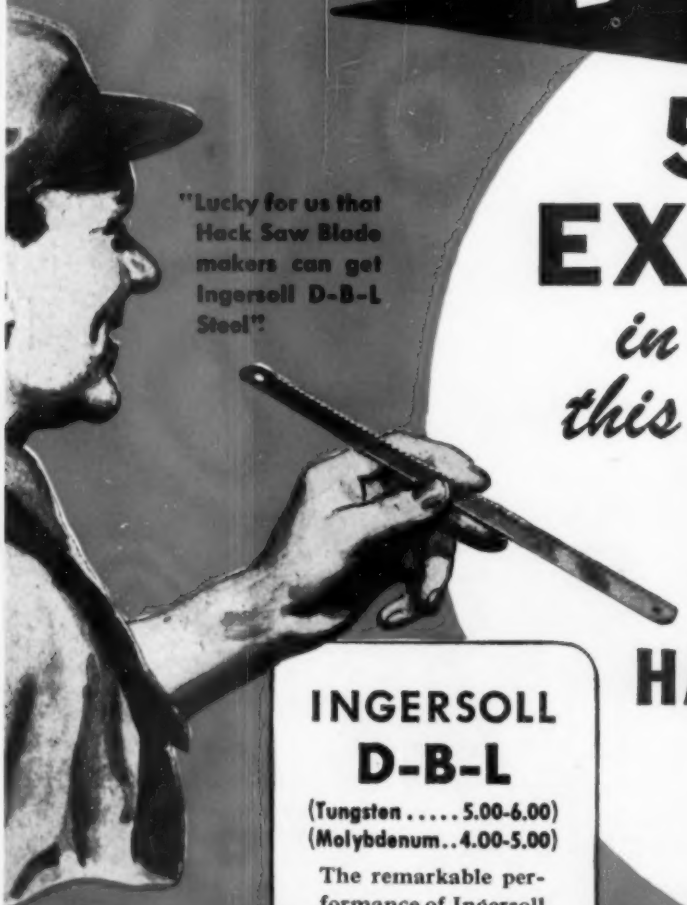
VINCO CORPORATION, 8857 SCHAEFER HIGHWAY, DETROIT 27, MICH.
SALES OFFICES— NEW YORK CLEVELAND CHICAGO

MILLIONTHS OF AN INCH FOR SALE BY VINCO

Semi-Automatic Hydraulic Spline and Gear Grinder • Optical Master Inspection Dividing Head • Involute Checker • Angle Tangent to Radius Dresser • Index Plates • Precision Vises • Sine Bars • Straight-side Spline, Serration Spline, Involute Spline and Helical Spline Plug and Ring Gages • Thread Plugs, Rings and Setting Plug Gages • Spur and Helical Master Gears • Munition Gages • Propeller Hub Gages • Built-up and Special Gages • Gear Rolling Fixtures • Spline and Index Fixtures • Hydraulic Power, Control, Utilization and Distribution Units • Engineering, Design and Development.

When You Order Your Favorite Brand of HACK SAW BLADES Specify this—

"made from INGERSOLL D-B-L STEEL"



5 YEARS EXPERIENCE

in the Production of this Lower Cost Type of

HIGH SPEED STEEL *for* HACK SAW BLADES

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Specify Ingersoll D-B-L Steel for your Hack Saw Blades on its 5-year Record of Past Performance.

INGERSOLL D-B-L

(Tungsten . . . . . 5.00-6.00)
(Molybdenum . . 4.00-5.00)

The remarkable performance of Ingersoll D-B-L . . . its relative freedom from decarburization . . . its tough cutting quality and its high impact resistance . . . plus its lower cost, have made it a wartime favorite.

"A Borg-Warner Product"

INGERSOLL STEEL & DISC DIVISION
BORG-WARNER CORPORATION
NEW CASTLE, INDIANA
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.

INGERSOLL SPECIAL STEELS FOR SPECIAL USE

Alloy Steels
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Tillage Steels
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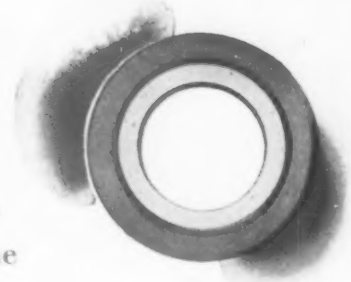
Shovel Steels
Knife Steels
TEM-CROSS Steel
IngAclad (Stainless-Clad Steel)
Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels

Goodbye Guesswork!



Many of the new precision standards demanded in war industry are certain to be carried on in peacetime production.

They are going to mean better machines, better appliances, for living and working.

These close tolerances can be maintained only through constant use of gages, to check both tools and finished parts.

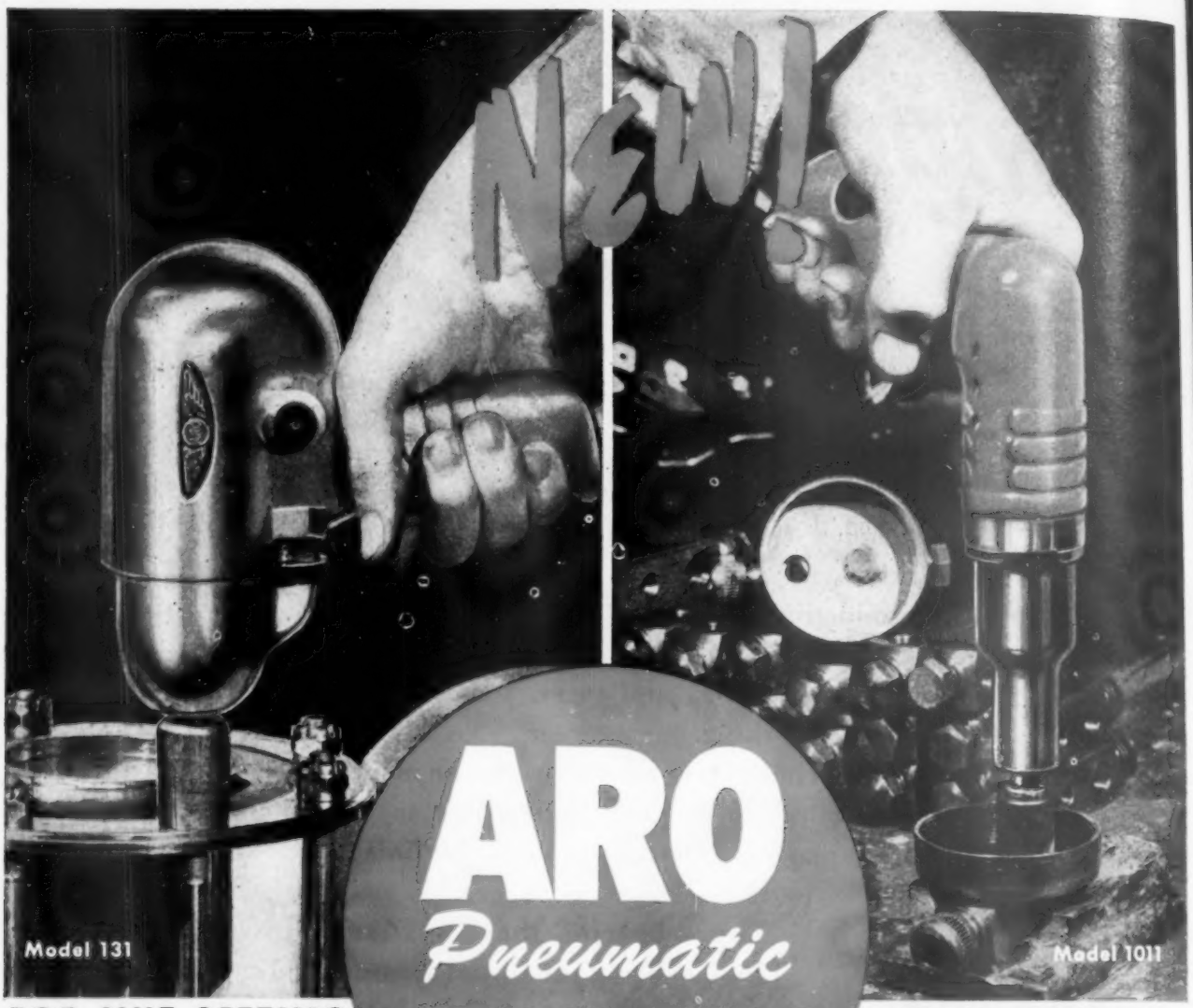
Gages bearing the PM Diamond Emblem bring you initial accuracy and the perfection of finish that insures long wear.

Pipe Machinery carries in stock a large assortment of standard plug, ring and thread gages from which prompt shipment can be made.

And we shall be glad to quote you prices and delivery dates on special gages to meet particular requirements.

ARMY E NAVY

The PIPE MACHINERY COMPANY Cleveland, O.



ARO Pneumatic IMPACT TOOLS

FOR NUT SETTING OR SCREW DRIVING

WITH SIMPLE TORQUE CONTROL

REVOLUTIONARY NEW, SIMPLE IMPACT MECHANISM

● Now for the first time you can set nuts and drive screws rapidly and accurately without stretching, stripping or "burning"... made possible with the new ARO impact mechanism with CONTROLLED TORQUE.

Backed by years of testing, proving and perfecting, this amazingly simple mechanism has only four moving parts... dispensing entirely with clutch jaws, springs, adjustment nuts and screws.

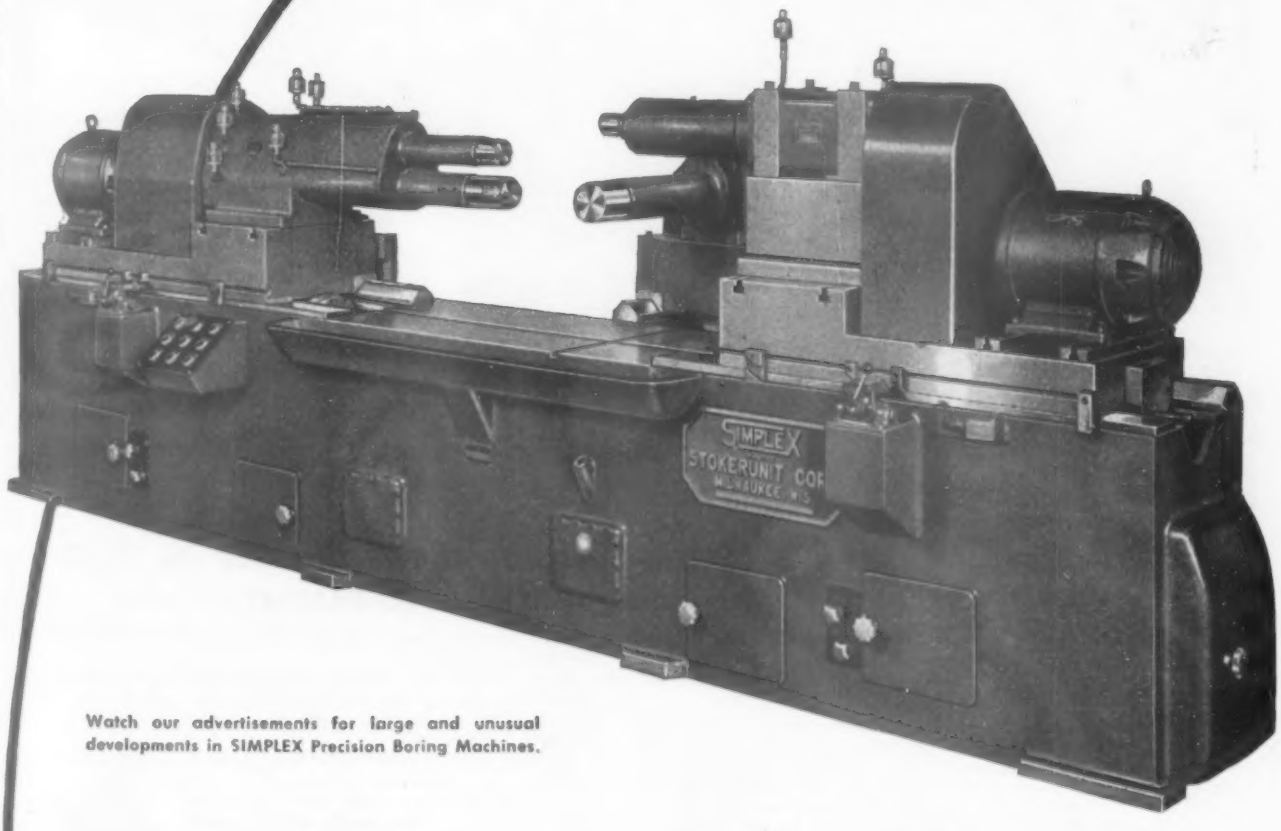
Pneumatic powered... light weight... ruggedly built. For greater speed, longer life, less fatigue, lower maintenance costs and higher efficiency... specify ARO impact tools... available in models up to $\frac{3}{8}$" capacity. Write for new catalog No. 44. The Aro Equipment Corporation, Bryan, Ohio.

THE ARO EQUIP. CORP. PNEUMATIC ARO TOOLS BRYAN, OHIO

SIMPLEX

When a leading tractor manufacturer contracted to build a transmission for a military tractor, they realized they could not take any chances with Government inspection. A SIMPLEX 3U 3-way Precision Boring Machine, large enough to bore a unit 4' long, made a quick and easy job of getting them out swiftly — and right!

The transmission case was approximately rectangular, 48" long, 19" wide and 21" high. There were six bores, ranging from 2¾" to 6½". Most of them were located so deep in the casting that extension type spindle heads were necessary. With this arrangement there was very little tool overhang, accuracy was easily maintained, tool life increased, chatter avoided.



Watch our advertisements for large and unusual developments in SIMPLEX Precision Boring Machines.

Precision Boring Machines

STOKERUNIT CORPORATION

SIMPLEX Precision Boring Machines and Planer Type Milling Machines

4528 West Mitchell Street, Milwaukee 14, Wisconsin

When to use multiple-spindle honing...

(Below) *This battery of* BARNESDRIL *Single Spindle Machines on aircraft cylinder assembly line hones nitrided barrels (Hardness 65 Rockwell "C") to limits of .0005" and finished to 2.5 micro-inches.*

The BARNESDRIL *214 Machine, shown above, gives multiple honing advantages to individual parts. Special holding fixture has spare station which is reloaded during honing time.*

BARNESDRIL ENGINEERS WILL FIND THE ANSWER IN YOUR PART DESIGN AND PRODUCTION REQUIREMENTS

The design of your part and your production requirements determine whether or not multiple honing is the most practical solution to your internal finishing operation.

On jobs where production requirements are high, like the finishing of bores of this 8-cylinder block, shown above, BARNESDRIL Multiple Spindle Honers are paying for themselves in time savings. Two machines are used, the first for rough honing, and the second for mirror finish honing. The bores of the block are honed simultaneously by the 8 spindles of the Multiple Honer. Production is approximately 100 blocks per hour, whether 8, 6 or 4-cylinder blocks.

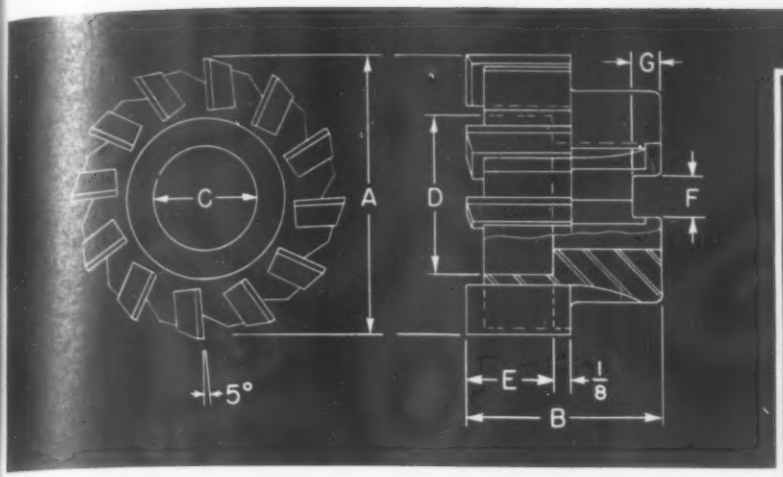
Where high production is required on individual parts, such as tractor sleeves, more than one part can be honed simultaneously on a Multiple Honer like the BARNESDRIL No. 214 Machine shown right above. Special fixtures designed to hold more than one part enable the operator to hone several parts in one operation.

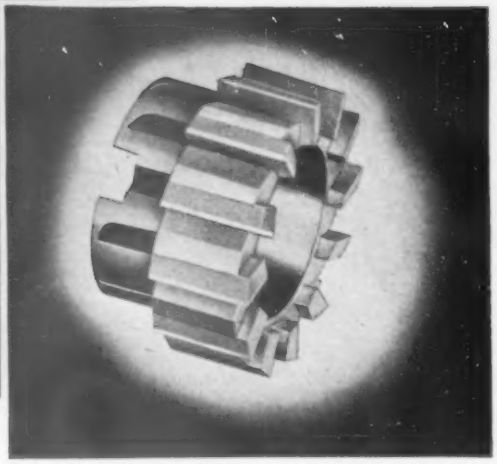
Less specialized honing applications where production does not warrant the use of a Multiple Spindle Honer can be handled satisfactorily with the BARNESDRIL Single Spindle models.

Submit your internal finishing problems to BARNESDRIL Engineers. The men who pioneered the field of honing machinery will study your part and recommend the machine best suited to your part design and production requirements. There is no obligation.

GET THIS FREE DATA— Bulletin No. T-121. describes the honing process and gives complete descriptions and specifications of the BARNESDRIL Honing Machines. Write for your copy today.

Barnes Drill Co. 848-71 CHESTNUT STREET ROCKFORD ILLINOIS, U.S.A.





Use HAYNES STELLITE END MILLS *For Faster Milling!*

HAYNES STELLITE shell end mills with brazed-in blades are fine-pitch cutters developed for faster milling. These end mills are operated on cast iron, malleable iron and semisteel, with a chip load of 0.10 to 0.15 in. per tooth. They are also successfully used on mild steel with a load of 0.005 to 0.010 in. per tooth. On nonferrous metals, and on plastics, hard rubber, or fiber, the chip load is often increased to 0.030 inch.

These high-production tools are operated on light milling jobs at surface speeds as high as 300 ft. per min. on cast and malleable irons—600 ft. per min. on brass —1,200 ft. per min. on aluminum.

HAYNES STELLITE alloy cutters are finished according to the A.S.T.E. Simplified Practice Committee standards for milling cutters to fit standard arbor equipment. Sizes other than those shown in the table can be made upon request.

Diameter (A)	Thickness (B)	Hole (C)	Counterbore (D)	Counterbore (E)	Drive Slot (F)	Drive Slot (G)	Size of Blades	No. of Teeth
1 1/4	1	0.500	11/16	3/8	0.260	5/32	3/16 x 1/4 x 1/2	8
1 1/2	1 1/8	0.500	3/4	1/2	0.260	5/32	3/16 x 5/16 x 5/8	10
1 3/4	1 1/4	0.750	1 1/6	1/2	0.322	3/16	3/16 x 5/16 x 5/8	10
2	1 3/8	0.750	1 1/8	5/8	0.322	3/16	3/16 x 3/8 x 3/4	12
2 1/4	1 1/2	1.000	1 3/8	3/4	0.385	7/32	3/16 x 3/8 x 7/8	12
2 1/2	1 5/8	1.000	1 3/8	7/8	0.385	7/32	3/16 x 1/2 x 1	14
2 3/4	1 5/8	1.000	1 5/8	7/8	0.385	7/32	3/16 x 1/2 x 1	14
3	1 3/4	1.250	1 7/8	1	0.510	9/32	1/4 x 1/2 x 1 1/8	14
3 1/2	1 7/8	1.250	2 1/8	1 1/8	0.510	9/32	1/4 x 5/8 x 1 1/4	16
4	2 1/4	1.500	2 1/2	1 1/4	0.635	3/8	1/4 x 5/8 x 1 3/8	18

Send For Free Booklet

For more information on HAYNES STELLITE high-production cutting tools not only for milling, but also for turning, facing, boring, and other operations, write for the booklet "Operating Information on Haynes Stellite 98M2 Tools." Ask for F-5350.

HAYNES STELLITE TRADE-MARK

HAYNES STELLITE COMPANY

Unit of Union Carbide and Carbon Corporation

New York 17, N. Y. UCC Kokomo, Ind.

Chicago—Cleveland—Detroit—Houston—Los Angeles—San Francisco—Tulsa

• HIGH-PRODUCTION METAL-CUTTING TOOLS •

"*HAYNES STELLITE*" is a registered trade-mark of Haynes Stellite Company.

HANCHETT MANUFACTURING CO.

MEMO TO: *Chief Engineer*

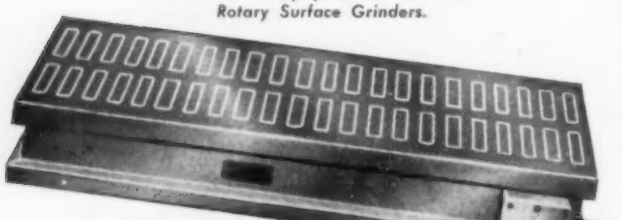
Suggest you develop waterproof, long-life magnetic chucks to meet our own exacting specifications.

Sales Dept.

-So We Had To MAKE OUR OWN!

And Now These Finer Quality Chucks are Available to You

36 in. ROTARY MAGNETIC CHUCK— Used for many years on Hanchett Rotary Surface Grinders.



RECTANGULAR MAGNETIC CHUCK —Installed on Hanchett Reciprocating Table Grinders.

Revolving MAGNETIC CHUCK—Holds knives accurately, rigidly, in any position.

The new Hanchett electro-magnetic chucks are really dependable! Triple-sealed against moisture—coils keep dry, because they're absolutely waterproof and shockproof. The patented construction technique embodies new materials and new features that have been thoroughly field-tested for a number of years, and have withstood rigorous treatment without faltering—the real test of materials and workmanship. (On February 18, 1944, a Hanchett rectangular magnetic chuck was immersed in a coolant bath with face plate off, leaving interior of the body exposed. Ever since then, the current has been turned on for seven minutes, then off for seven minutes. The chuck has been completely checked every week, and as yet has shown *no sign of breakdown!)*

Hanchett's 70 years of practical experience in grinder manufacture were combined with the skills and abilities of veteran engineers and designers to make magnetic chucks more reliable than ever before. Hanchett chucks are built in sizes and styles to meet any requirements. The most modern and completely equipped magnetic chuck department in the industry stands ready to help you. Feel free to ask for assistance on your particular problem. And write for details on the complete line, together with construction features, in bulletin 170 T-12.

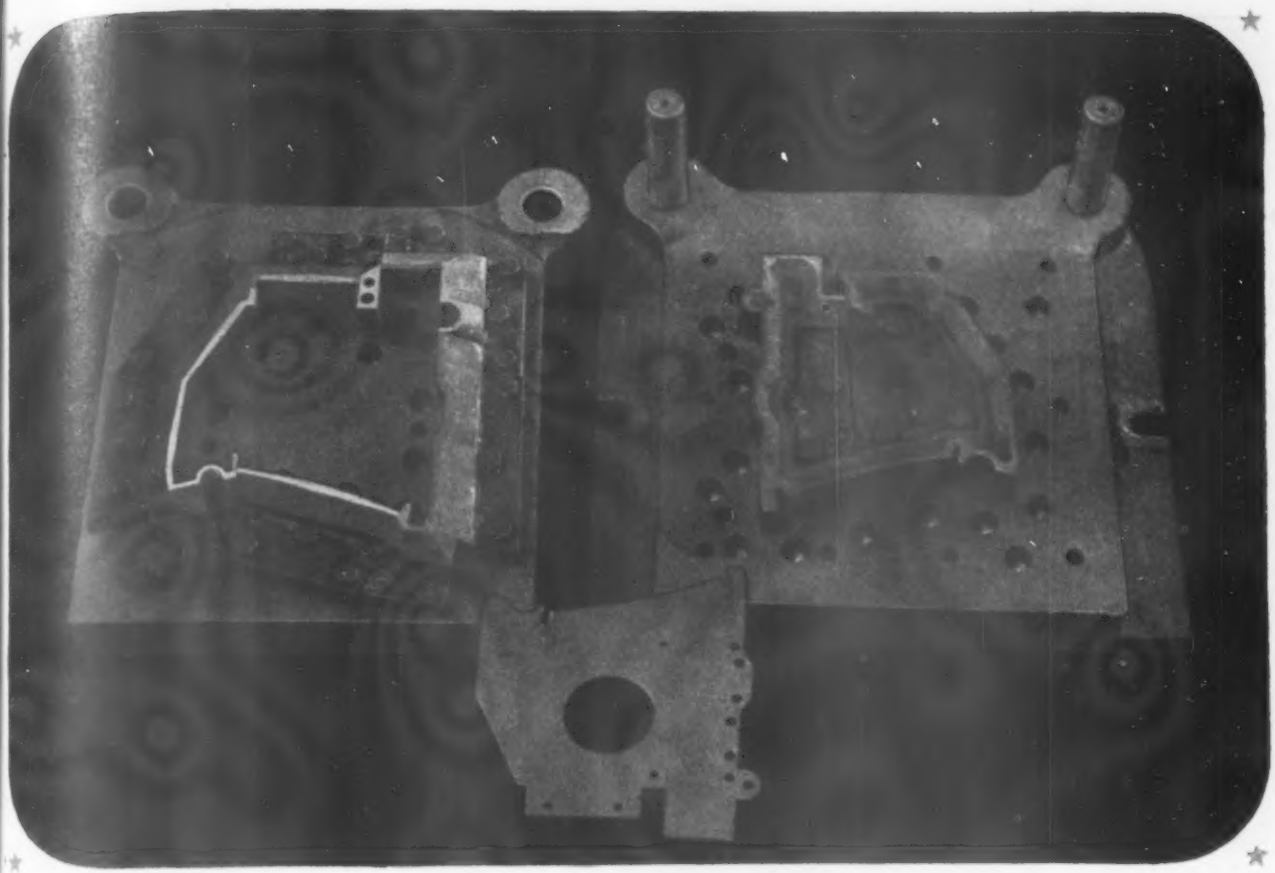
Dealers — send for data.

HANCHETT GRINDERS — BIG RAPIDS MICHIGAN

IF IT'S A FLAT SURFACE—THERE'S A HANCHETT TO GRIND IT

HANCHETT MANUFACTURING CO.

BIG RAPIDS, MICHIGAN U.S.A.



HOW TO *Cut Costs and "Corners"* ON YOUR BLANKING DIES

You can save steel and time in the making of dies for blanking, trimming, beading, or any application involving the cutting of sheet metals to regular or irregular shapes, by assembling them from FCC Composite Steel Die Sections.

These prefabricated die parts consist of fine tool steel cutting edges, in a selection of grades, electrically welded by a special process to non-hardenable mild steel bases. Thus, screw and dowel holes may be easily drilled after heat treating, and there are numerous other advantages that will be immediately obvious to the die maker.

Thousands of die shapes may be made up from combinations of thirty-five standard sections. Specially shaped sections are manufactured to customers' specifications in five to ten days.

Prompt delivery under CMP.

WRITE FOR ENGINEERING DATA

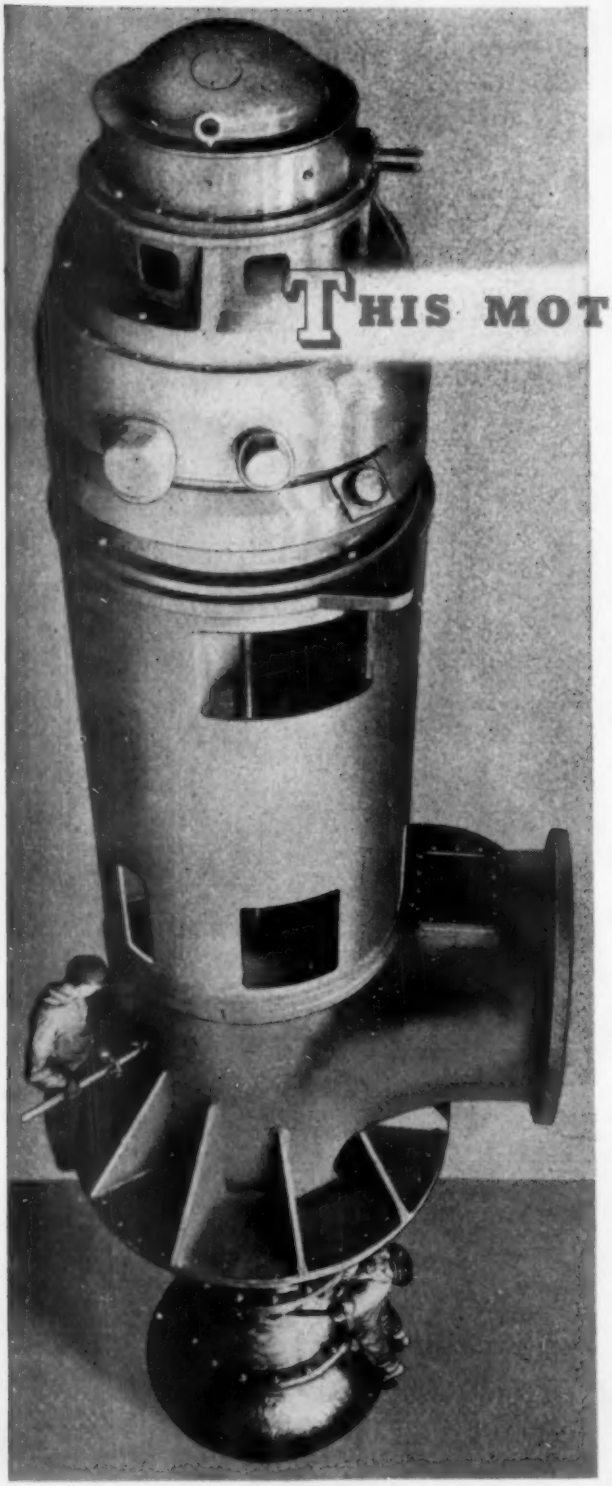
It contains a print showing the various standard shapes available for quick shipment, and explains how to order special shapes, including rib-reinforced extra high sections. It also contains prices. Get your copy—write for it today.

ADDRESS DEPT. TE-25

AL
STEEL FOR THE NATION'S WELFARE

Allegheny Ludlum
STEEL CORPORATION
Forging and Casting Division
DETROIT 20, MICHIGAN

W & D 9477



THIS MOTOR PUSHES A "RIVER"

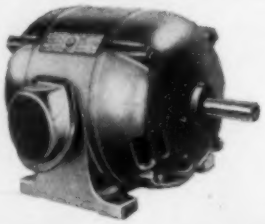
Surface condensers for power generating stations require the pumping of literally "rivers" of water. 40,000 gallons per minute is a lot of water, yet that is the capacity of this vertical, propeller-type circulating pump—a type now being used by a number of large utility companies.

To push that much water around takes plenty of power, and this specially designed Westinghouse motor delivers the 350 hp punch necessary to do the job.

You'll probably never need a motor to "push a river"—but the same kind of engineering skill that goes into such specialized motor jobs is back of every Westinghouse motor you buy.

This ready-to-use experience is available to you for wartime needs—or in planning for postwar conversion. It can help you solve any drive problem quickly—with a motor exactly fitted to the job. Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.

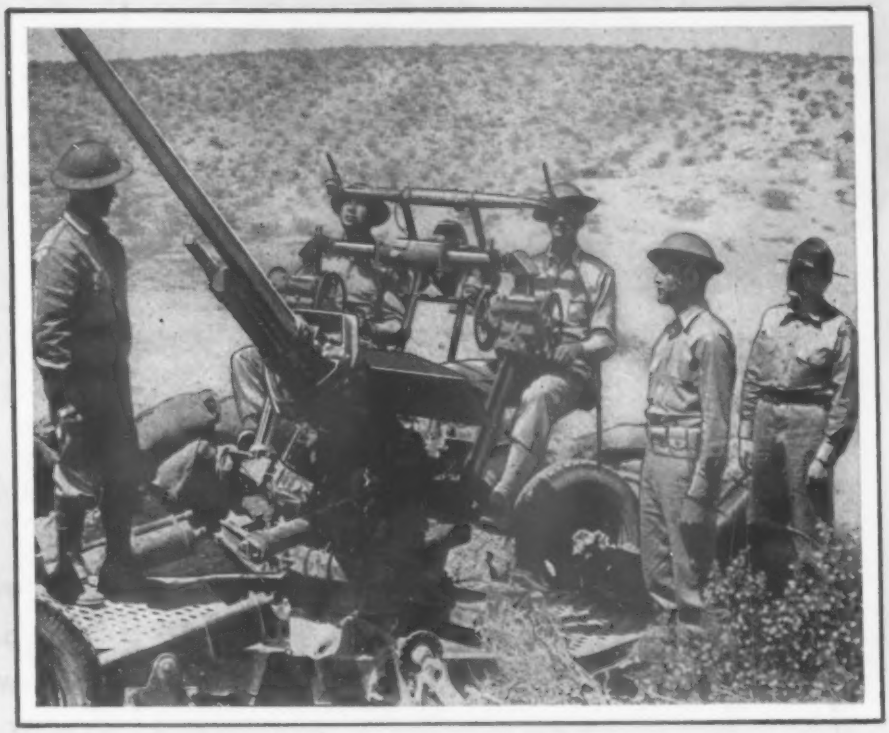
J-21300



This is only one of the many Westinghouse general-purpose motors available in standard and special enclosures. Features include choice of sealed-sleeve or ball bearings; Tuffernell insulation; dynamically balanced rotor; rigid one-piece frame; die-cast rotor; radio-frequency tested insulation.

Westinghouse motors

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE



Shooting the "BIG DUCKS" MILES AWAY

Shooting enemy planes at a distance of several miles is like shooting big ducks on a grand scale. The gunner must "lead" the target to allow for its movement while the shell is getting there.

Hence, the antiaircraft gun is never sighted at what it is trying to kill—but at some point in advance of the target.

The eye and experience of the most expert duck hunter would be of little use in shooting these "big ducks." The pointing of the gun is a complicated mathematical problem, solved by an elaborate plotting machine. The gun must follow orders of this plotting device with utmost exactness.

Without precision of the very highest order in every critical part, the gun couldn't hit the "big ducks." Antiaircraft fire would be mildly annoying instead of having deadly accuracy.

Microhoning contributes largely to this result because it provides the modern production approach to precision in final stock removal—maximum precision control of surface character.

Without this *production* approach to precision, it would be impossible to build these "big duck" guns in the quantities needed.

Some Microhoned Bores in Antiaircraft and Other Ordnance

Rifle Barrel Lands • Rifle Barrel Grooves • Recuperator Cylinders • Regulator Cylinders • Variable Recoil Cylinders • Rifle Hoops • Tapered Gun Chambers . . . (Guns from 2½ feet to 75 feet long—.30 caliber to 16 inch in diameter).

MICROMATIC HONE CORPORATION

DETROIT 4, MICHIGAN

CHECK YOUR USES HERE...

and see how many jobs Masonite* Die Stock can do for YOU

- Forming Blocks
- Drill Fixtures
- Welding Fixtures
- Final Assembly Fixtures
- Deep Draw Pressure Ring Dies
- Mating Type Dies
- Blanking Dies
- Router Templates
- Stretcher Forms
- Wiping Blocks
- Fixture Pads
- Keller Profile Patterns
- Mock-Ups
- Cradle Jigs
- Table Jigs
- Spot Welding Fixtures
- Plexiglass Forms and Fixtures
- Rivet Fixtures
- Spinning Chucks
- Back-Up Blocks

This isn't a complete list of the uses of Masonite Die Stock. No such list is possible . . . because industry is constantly discovering new ways by which this amazing semi-plastic material can help do a *faster, better job at less cost.*

If you haven't tried this modern, light-weight die stock, the time to give it a trial is right now. For full particulars, simply fill out the coupon.

PRODUCTION PIN-UPS. Be sure to look for the next issue of "Production Pin-Ups" on your plant bulletin board. They give you pictures and explanations of the latest uses of Masonite Die Stock.

MASONITE CORPORATION
Dept. TE-10, 111 W. Washington St., Chicago 2, Illinois

Please send me illustrative literature and complete information about Masonite Die Stock.

NAME AND FIRM_____

ADDRESS_____

CITY_____ STATE_____

What the world's largest user says about Machine Tools

A manufacturer whose postwar plans call for a hundred thousand machine tools knows what he wants—what kind of machines will best handle his work. And he has told industry about it!

Here are summarized some of the important features this company wants, along with the Acme-Gridley specifications which meet these requirements.

User's Preference	Acme-Gridley Feature
INCREASED FEEDS AND SPEEDS	
More powerful machines to handle new developments in cutting tools and super-speed milling.	Speeds and feeds as fast as modern cutting tools will stand.
ELECTRIC CONTROLS	
Must be properly located, accessible, protected against dirt and damage, and dependable.	Namco Snap-Lock heavy duty Station Control and Limit Switches meet the most exacting military and industrial safety and life requirements.
LUBRICATION	
Every bearing to be lubricated from a central sump. Accessible filters and piping of adequate size.	Central lubrication and coolant systems conform to modern, accepted practices.
ACCESSIBILITY OF PARTS	
Ability to get at all parts quickly without taking entire machine apart, much more important than streamlined appearance.	Machines designed for complete accessibility of operating, tooling, service and adjustment.
CHIP DISPOSAL	
Want wider space between machine ways, with quick chip disposal and separation from coolant.	Entire tooling and cutting area open from both sides, easy to keep clear, and automatic conveyor disposal.

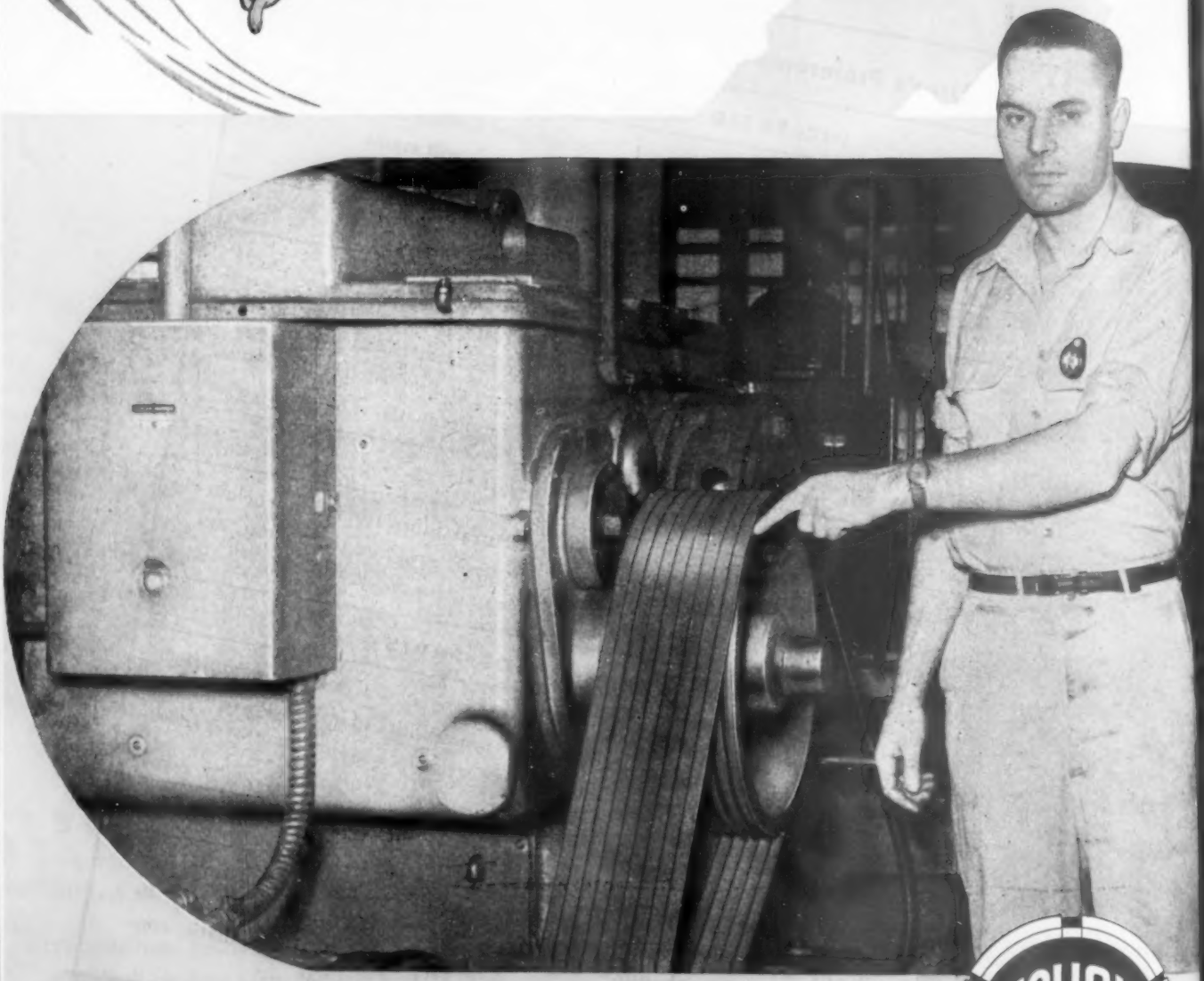
Correspondence invited with manufacturers interested in modern, cost-cutting parts production.

THE NATIONAL ACME CO.

170 EAST 131ST STREET • CLEVELAND 8, OHIO

ACME-GRIDLEY 4-6 AND 8 SPINDLE BAR AND CHUCKING AUTOMATICS • SINGLE SPINDLE AUTOMATICS • AUTOMATIC THREADING DIES AND TAPS
THE CHRONOLOG • LIMIT, MOTOR STARTER AND CONTROL STATION SWITCHES • SOLENOIDS • CENTRIFUGES • CONTRACT MANUFACTURING

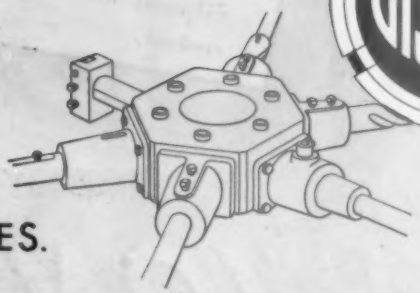
Don't slip on this one!



KEEP ALL VEE-BELTS AT PROPER TENSION

Slipping belts cause loss of power, excess heat and rapid belt wear.

There is no excuse for this waste with the easy belt adjustment provided by GISHOLT TURRET LATHES.



GISHOLT

★ *Reproductions of this page on enameled paper are available for use in your turret lathe department. Write the Gisholt Machine Company, 1229 East Washington Avenue, Madison 3, Wisconsin. Ask for the series of "Wartime Care and Operation" posters. State quantity desired.*

DEPENDABLE POWER ON EVERY STROKE

"Logan" Model EC—Double-acting, Non-Rotating Cushioning Type Air Cylinder. Recommended pressure 150 lbs.

For PUSHING PULLING and LIFTING *Operations*

"LOGAN" AIR CYLINDERS

For every operation requiring power movement for pushing, pulling or lifting, there is a Logan Air Cylinder that will do the job faster, better and at lower cost.

These sturdy, double-acting cylinders are built out of "Logan's" 25 years' experience in air and hydraulic engineering and embody many distinctive features of design and construction that combine to deliver fast, dependable and economical power on every stroke.

Heavy, rugged construction permits the use of increased air pressure, while the large inlets and outlets allow for quicker action. Self-adjusting air packings insure efficient performance by preventing loss of power.

"Logan" non-rotating air cylinders are made in eight standard models, in bore diameters from 1½" to 24", and any length stroke up to 18 feet. All models can be furnished with adjustable cushion feature when desired. Write for Catalog S-25.

LOGANSPORT MACHINE CO., INC.
902 PAYSON ROAD, LOGANSPORT, IND.

"LOGAN" *Air and Hydraulic Equipment*

CHUCKS ★ CYLINDERS ★ VALVES ★ PRESSES ★ SURE FLOW COOLANT PUMPS

1. Boosts Output as much as 20%
2. Cuts refinishing of Parts, Rejects and Scrap Losses
3. Ends Hazard of Whirling and Whipping Bar Ends
4. Reduces Noise and Nervous Fatigue

LIPE

Automatic-Pneumatic BAR FEED

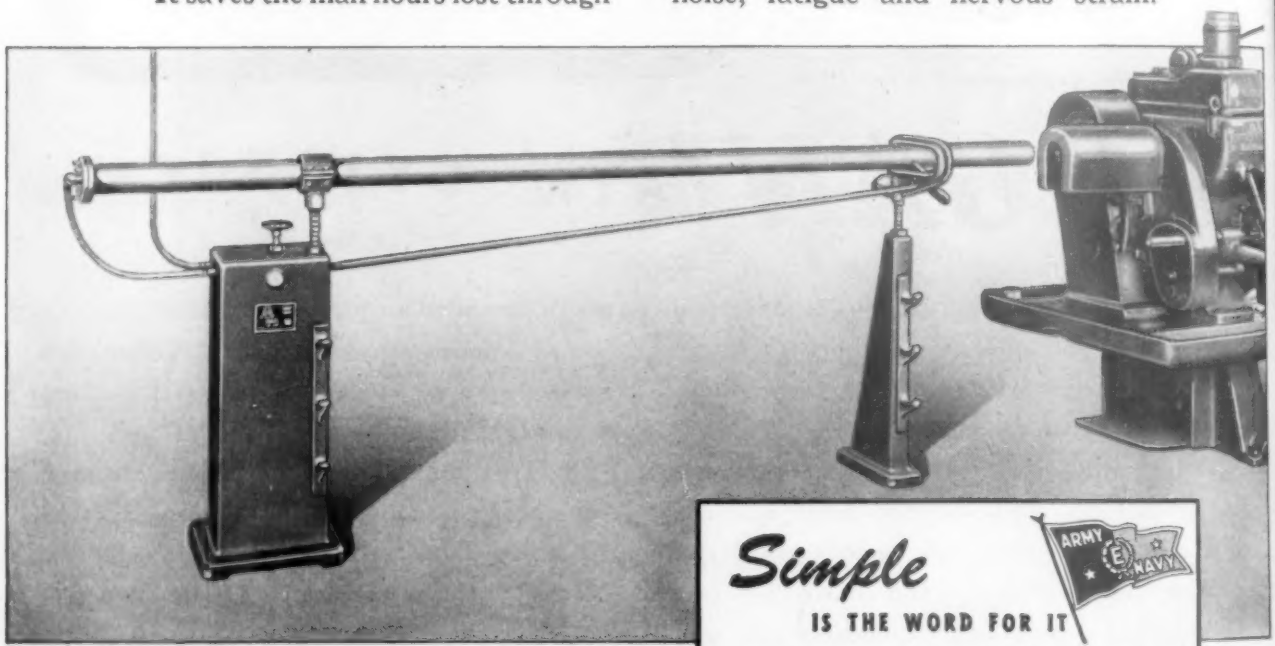
. . . a quick, low-cost solution to the manpower problem

Lipe Pneumatic Bar Feed gives you the equivalent of 12 extra minutes production every hour by boosting the output per man and machine.

It saves the losses in man and machine hours that result from rejects and refinishing of parts.

It saves the man hours lost through accidents resulting from whirling and whipping bar ends.

And it reduces the mid-day and mid-week slow downs caused by noise, fatigue and nervous strain.



Available for all hand screw machines up to $2\frac{1}{2}$" capacity, and for automatic screw machines Nos. 00, 0, 2 and 6. Don't wait for re-conversion to catch you short-handed. Find out now. Ask for descriptive literature, or for a nearby Lipe technical representative to call.

Simple

IS THE WORD FOR IT

ARMY E NAVY

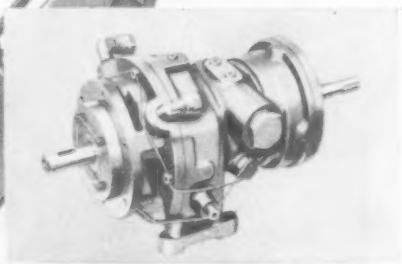
Just a piston with a ball-bearing cup center that is advanced through a cylinder by low-pressure air. Just hook it up to your shop air-line and forget your feed troubles.

LIPE-Rollway Corporation... SYRACUSE, N. Y.

MACHINE DESIGNERS CAN TAKE A TIP FROM THE USE OF OILGEAR TRANSMISSIONS IN AMERICA'S NEWEST, MOST EFFECTIVE ANTI-AIRCRAFT GUN

A typical example of the almost unlimited flexibility of Oilgear Fluid Power, the things you can do with it, is the highly successful use of Oilgear Transmissions in America's newest and most effective 40 M M anti-aircraft guns. Two Oilgear Transmissions serve each gun. One moves the carriage from side to side, the other elevates the gun muzzle. The two transmissions are self-synchronizing and work automatically on signals from the director-mechanism. Enemy planes may come in from any direction, at tree-top level as well as at great heights. Hence, these Oilgear Transmissions provide rapid slewing and elevating speeds with precise, rapid and accurate deceleration as the gun centers on the target, and appropriate following speed. Plane evasive tactics are met by variable synchronization of the two directions of travel. Easy and speedy disengagement and re-engagement of automatic operation is also provided. These Oilgear transmissions are small, powerful, dependable.

In the functions outlined above, or elsewhere in the wide range of characteristics of Oilgear Fluid Power you are almost certain to find a better solution to the problem that confronts you. Write for further information or put your problem up to Oilgear Engineers. Do it *now*. . . . THE OILGEAR COMPANY, 1308 West Bruce Street, Milwaukee 4, Wisconsin.



External view of Oilgear new, smaller, efficient, high speed transmissions as used on newest 40 M.M anti-aircraft gun control system which also incorporates travel limit switches, unlimited azimuth angle and increased elevation angle, push-button controlled high-speed slewing, increased torque and speed of operation.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

You Need Oilgear!

OILGEAR

Fluid Power

Die of *Speed Treat* Steel Cost Less:

Gave Twice the Production!

CASE STUDY

User: **Standard Railway Equipment Mfg. Co.**

Application: **Corner flanging dies for forming patented Murphy ends and sides for railway cars.**

End Use: **Dies cold form 3/16″ and 1/4″ plate on 1,000-ton press. Abrasion is excessive because of scale on plate. Female die is approximately 15″ high x 9″ wide x 10″ deep.**

Heat-Treatment: **Pack-hardened to 52-54 Rockwell "C" scale.**

Result: **Dies were formerly made of nickel cast iron and never produced in excess of 100,000 pieces. Dies made from *Speed Treat* open hearth medium carbon hot rolled plate have produced a minimum of 200,000 pieces per die.**

Machining costs have been radically reduced with consequent lowering of tool costs. The satin finish on the impression surfaces was produced with far less grinding and polishing.

***SPEED-TREAT* Plate Provides.....**

- **Better Finish**
- **Lower Machining and Tooling Cost**
- **Ideal Response to Heat Treatment**
- **Negligible Heat Treat Distortion**
- **Reduced Weight**
- **As Much As 66⅔% Lower Material Cost**
- **Savings in Production Time**
- **Lowest Ultimate Cost**

Speed Treat **plate, an open hearth medium carbon steel, affords greater economy to tool and die makers than most high carbon steels. It is readily machinable, has high tensile strength and constant uniformity and responds to all types of heat treatment including selective surface hardening.**

Why not investigate this economical and practical steel for your own use? Send for name of your local *Speed Treat* plate distributor and a copy of Catalog No. 1243.

W. J. HOLLIDAY & CO.

Speed Case*—*Speed Treat **Plate Division**
Hammond, Indiana
"Established 1856"

Hammond and Indianapolis, Indiana ***Distributors in Principal Cities***

Quality Controlled *Speed Case* and *Speed Treat* Steel Is Available In All Common Plate Sizes

"There's more to Tapping than just cutting a thread"

says W. J. EBERLEIN, General Sales Manager,
GREENFIELD TAP & DIE CORPORATION, Greenfield, Massachusetts

Because users of taps are interested primarily in the screw threads produced, there is a tendency to disregard the fact that a tap is a precision tool. To insure perfect screw threads, care in tap selection and in proper conditions of use are of paramount importance.

"OF UTMOST IMPORTANCE is the fitting of the tap to the drilled hole in relation to the thread desired. The size of a drilled hole, prior to tapping, should be large enough to produce a thread depth of about 75%. (See formulae below.) In tapping a 100% thread depth, approximately 3 times more power is needed than when tapping a 75% thread, plus increase in tap breakage; yet the 100% thread is only about 5% stronger.

Formula for obtaining tap drill size:

$$\text{Outside Diameter} - \frac{.0130 \times \%\ \text{full thread}}{\text{number threads per inch}} = \text{Drill size}$$

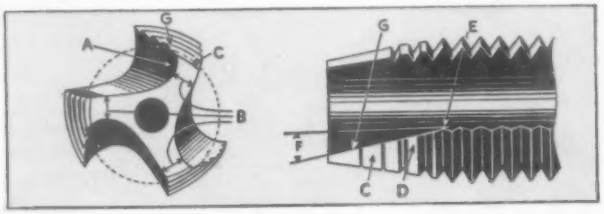
Example for ¼"–20 thread: $.250 - \frac{.0130 \times 75}{20} = .2013$ **or number 7 drill**

Formula for obtaining percentage of thread a given drill will produce:

$$\frac{(\text{Outside Diameter} - \text{Drill Size}) \times \text{number threads per inch}}{.0130} = \%\ \text{of full thread}$$

Example for ¼"–20 thread: $\frac{(.250 - .201) \times 20}{.0130} = 75.4\%$ **Thread**

"In the type of precision work being turned out today there is no place for dull, inaccurate taps. Trying to make a tap cut 'just one more thread' in order to 'speed' production often results in broken taps, rough threads, oversize cuts. These pitfalls can be avoided by sharpening at the first sign of dullness and, on production jobs, sharpening every so many holes.



"In sharpening a 'gun' tap always use a new one as a guide. Dress abrasive wheel to fit flute, maintaining exactly form of 'hook' (G) above. When ends of lands (B) become thin from continued regrinding, grind end of tap straight back until lands again reach normal thickness. Using new 'gun' tap as guide, carefully reform 'hook' at (G), at same time maintaining a straight cutting edge (A) and pronounced angle (F). In re-grinding chamfer (C) be sure to grind the relief, leaving cutting edge (A) the highest edge—gradually backing away towards heel, shown by circle at (C) in cut at the left above. Maintain angle (F) for shear cut. Remove only enough metal to keep the cutting edges sharp, at same time retaining the original form of flutes.

SUGGESTED TAPPING SPEEDS AND LUBRICANTS

Material Being Tapped	Speed in Feet per minute: Carbon Taps	Regular High Speed Taps	"Hand" High Speed Taps	Suggested Lubricant
Allegheny Metal	*	15–25	20–30	Active Sulfurized Cutting Oil
Aluminum	45–50	90–100	100–110	Sulfurized Cutting Oil
Bakelite	*	60–70	70–80	Dry
Brass	45–80	90–100	100–110	Inactive Sulfurized Cutting Oil
Bronze	20–30	40–60	50–70	Inactive Sulfurized Cutting Oil
Bronze-Manganese	*	30–45	35–50	Inactive Sulfurized Cutting Oil
Copper	45–50	90–100	100–110	Inactive Sulfurized Cutting Oil
Die Castings—				
Aluminum	30–35	60–70	70–80	Sulfurized Cutting Oil
Zinc	30–35	60–70	70–80	Water Soluble Oils
Duralumin	45–50	90–100	100–110	Sulfurized Cutting Oil
Fiber	*	80–90	90–100	Dry
Iron—				
Cast	*	70–80	80–90	Dry or Water Soluble Oil
Malleable	*	35–60	45–70	Water Soluble Oils[1]
Monel Metal	*	20–25	25–30	Active Sulfurized Cutting Oil
Nickel Silver	*	75–85	85–95	Active Sulfurized Cutting Oil
Rubber (Hard)	*	80–90	90–100	Dry
Steel: Cast	*	20–30	25–35	Active Sulfurized Cutting Oil
Chromium	*	20–30	25–35	Active Sulfurized Cutting Oil
Machinery	30–30	40–60	50–70	Active Sulfurized Cutting Oil
Manganese	*	10–15	15–20	Active Sulfurized Cutting Oil
Molybdenum	*	30–30	25–35	Active Sulfurized Cutting Oil
Nickel	*	25–35	30–40	Active Sulfurized Cutting Oil
Stainless	*	15–25	20–30	Active Sulfurized Cutting Oil
Tool	15–20	25–35	30–40	Active Sulfurized Cutting Oil
Tungsten	*	20–30	25–35	Active Sulfurized Cutting Oil
Vanadium	*	25–35	30–40	Active Sulfurized Cutting Oil

*Carbon steel taps are not recommended for these materials

"The importance of proper tapping speeds, and the use of the proper lubricant, cannot be stressed too strongly. For there is no one speed or lubricant that will produce efficient, economical tapping results under all conditions.

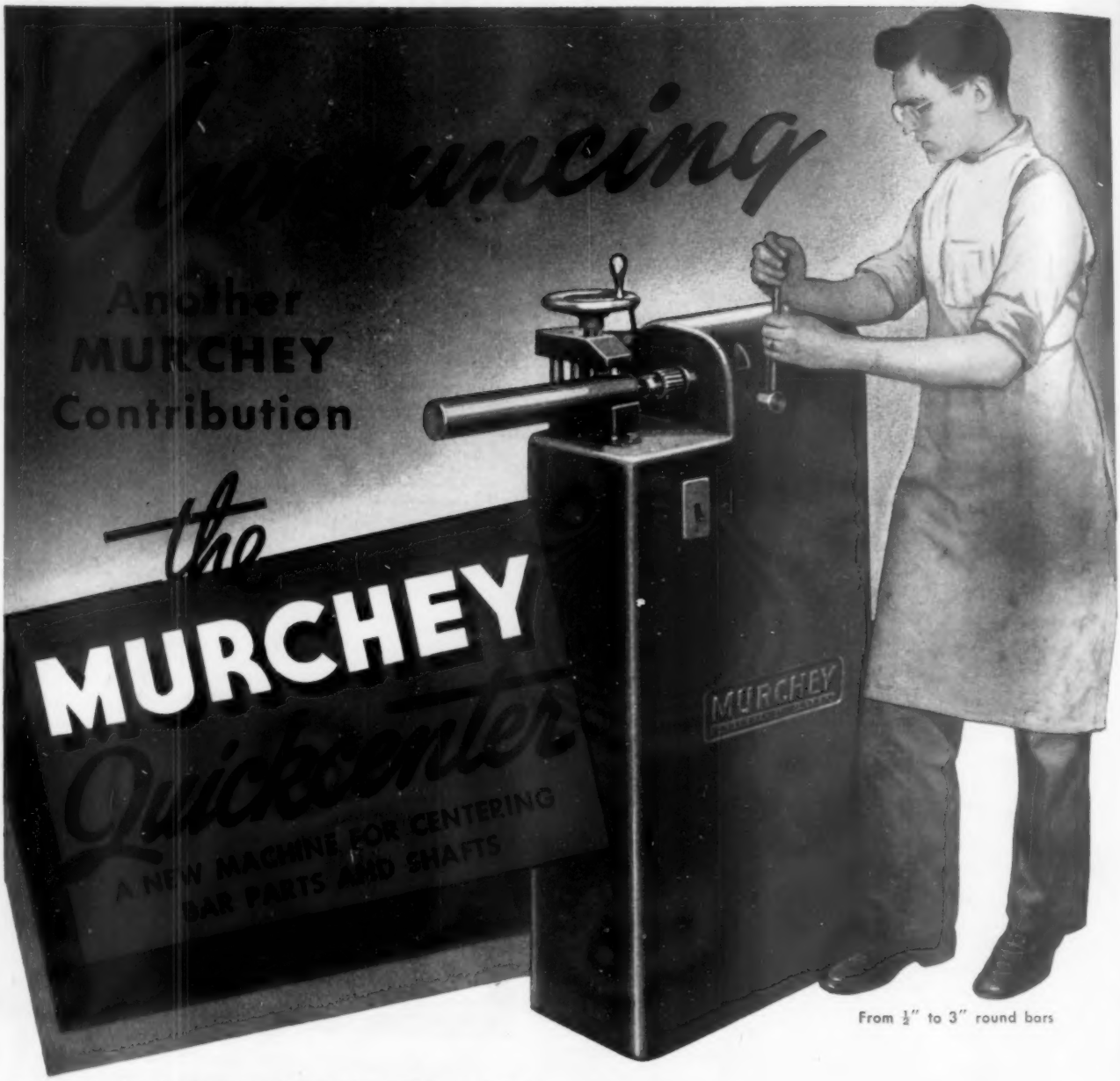
"The chart above will give you some idea of the wide variety of speeds and lubricants which may be used in tapping operations. (Consult a reliable cutting oil supplier for more specific data.)"

* * *

Longer tap life, increased production, better size control, smoother and more accurate threads, and the more efficient removal of chips are but a few of the results traceable to the application of the proper cutting fluids. It is because of this importance of the selection of the proper cutting oils that Shell Lubrication Engineers have developed a control technique that "balances" the oil to fit the machine, the application, and the tool. Ask the Shell man for the details.

SHELL CUTTING OILS
FOR METAL CUTTING AND GRINDING

SHELL



From ½" to 3" round bars

IT'S FAST! IT'S EASY! IT'S ACCURATE! . . .

You simply insert one end in the Vee-block, tighten the hand wheel and advance the center drill—then reverse the bar and center the other end. Your Quickcenter will do—in less than a minute—a job that may take over half an hour on a lathe . . . and do it far more easily and more accurately. The Murchey Quickcenter, small and compact, increases shop output, uses unskilled operators, saves time and material—and increases your profits.

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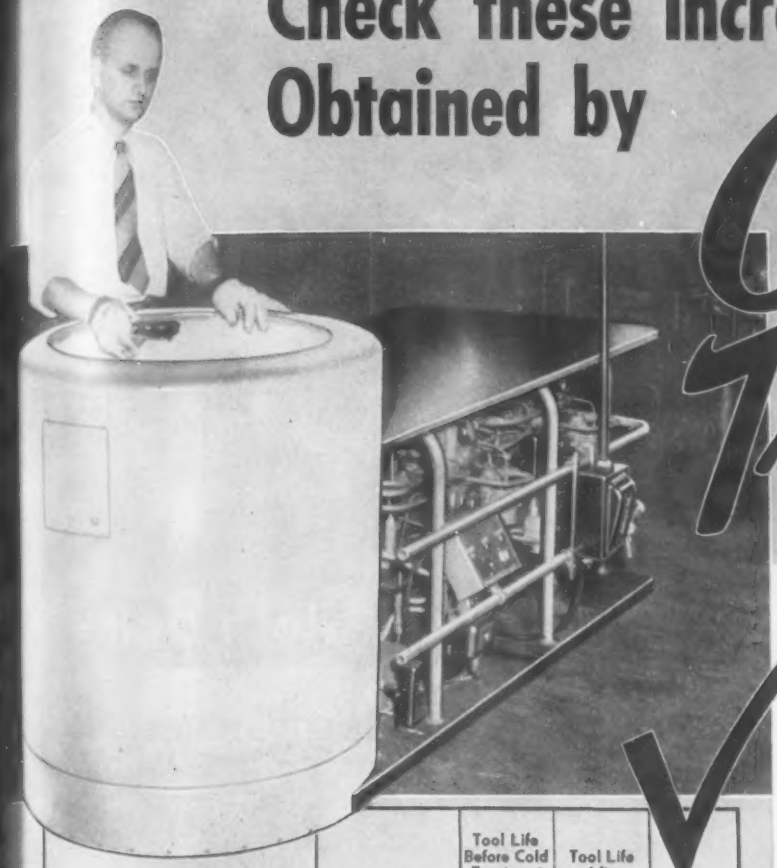
MURCHEY

Check these Increases in Tool Life Obtained by *Cold Treating* in a Deepfreeze Industrial Chilling Machine



Operation	Tool	Tool Life Before Cold Treatment (Number of pieces machined per grind)	Tool Life After Deepfreeze Cold Treatment	Increase
Milling foot pads on chrome moly steel motor mound	4½" end mill	40	84	110%
Drilling 338 holes in aluminum airplane fin	No. 29 drill No. 21 drill ⅛" drill No. 41 drill	112 54 82 144	280 108 164 288	150% 100% 100% 100%
Drilling 16 holes in chrome moly steel motor mound	No. 45 drill	8	50	525%
Drilling 12 holes in chrome moly steel side plates of motor mound	Combination 2³⁄₆₄" drill and ⅜" reamer	60	140	133%
Drilling 2 stainless steel parts	F drill	200	300	50%
Drilling holes in buck board for gun turret	No. 30 drill	10	32	220%
Average Increase in Tool Life on 6 Typical Jobs in This Plant...				165%

Manufacturer Averages 165% Increase on Six Typical Jobs...

The increased tool life obtainable by means of Deepfreeze cold treatment is being demonstrated every day in actual, practical applications like these six typical jobs from a large Mid-West manufacturer.

When tools were subjected to sub-zero temperatures in a Deepfreeze Cascade −120° F. Industrial Chilling Machine an average increase of 165% was recorded, based on the number of pieces it was possible to machine before resharpening the tool. Equal or longer life was obtained from subsequent grinding in most cases.

The cold treating procedure employed at this plant is as follows:

1—Heat part to approximately 300° F.

2—Allow to return to room temperature (approximately 100° F.).

3—Chill for 2 to 6 hours at minus 120° F. in a Deepfreeze Cascade −120° F. machine ⅔ full of methylene chloride convection fluid.

4—Allow to return to room temperature.

Repeat cycle six times.

Deepfreeze industrial chilling units make equally profitable results possible in every factory, job ing shop and heat treating plant. The process is easy and economical to use—results are positive.

In addition, Deepfreeze sub-zero equipment is being used effectively for shrink-fit assembly, stabilizing of gauge blocks and lapping flats, instrument testing at low temperatures, and other industrial work.

Put this valuable process to work in your plant. Learn what it is doing for others—and what it can profitably do for you. Write for this new 40-page booklet of actual performance data, applications and latest procedure.

Get these *Free* Additional Facts...

Cold treating is a comparatively new science, and has developed tremendously in recent months. All the latest authentic information on how and where to use sub-zero temperatures is contained in *"Cold Treating Practice"*—a 40-page illustrated booklet that will be sent upon request. Ask for Bulletin No. 1-4.

Only Motor Products can make a "DEEPFREEZE"

Deepfreeze

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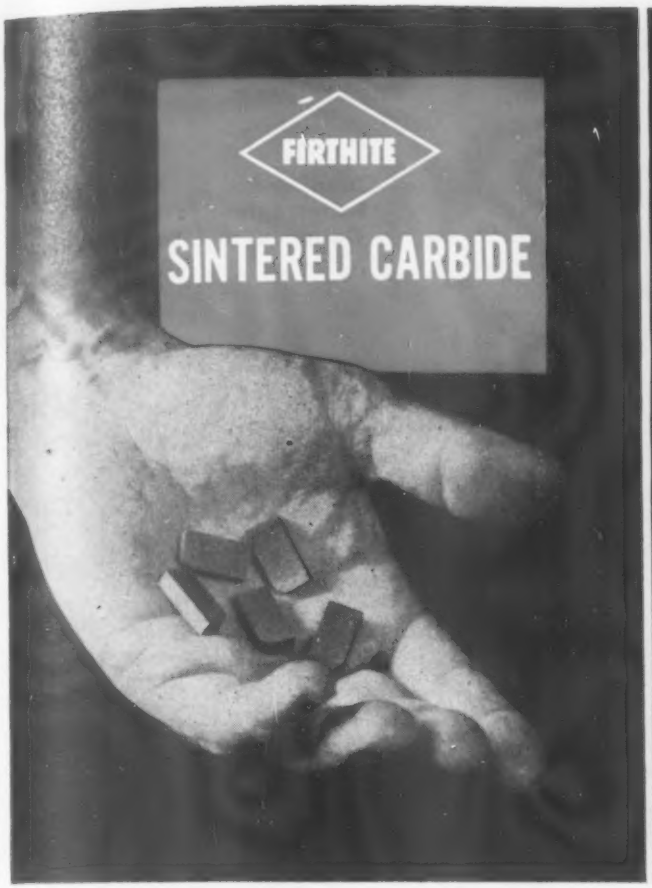
NORTH CHICAGO, ILLINOIS

...trial Chilling Equipment for Shrinking, Testing, Hardening and Stabilizing Metals

Division of Motor Products Corporation, Detroit, Michigan



THERE ARE PLACES FOR BOTH . . .

Firth-Sterling, long specialists in making steels for shop tooling, early recognized the possibilities of carbides as a means of extending the improvement in shop practice brought about by the super high-speed steel—CIRCLE C. **But, there is a place for both . . .**

Where the highest speeds are obtainable or materials are hardest, FIRTHITE is the "last word" in a cutting material. It is used at speeds up to ten times those possible with high-speed steels. Where speeds above average are permissible or materials are "on the hard side," CIRCLE C will cut *at least* 25% faster than ordinary grades of high-speed steel. Send for descriptive literature on these remarkable materials.

For instance:

FIRTHITE *removes* 730 pounds of gray-iron casting metal per hour instead of 180 pounds;

drills a gun barrel in 23 minutes instead of 1 hour;

enables milling-cutters to run at 1,000 feet per minute instead of 100 feet with previous materials.

For instance:

CIRCLE C *machines* hard die blocks in 28 hours instead of 42 hours . . . doubling production between grinds — versus regular high-speed steel;

turns two to ten times more pieces of heat-treated alloy steel between grinds than other high-speed steels.

See the Firthite Movie to be shown in Booth No. B-146 at the National Metal Congress, Cleveland, O., Oct. 16 to 20, incl.

Firth-Sterling Steel Company

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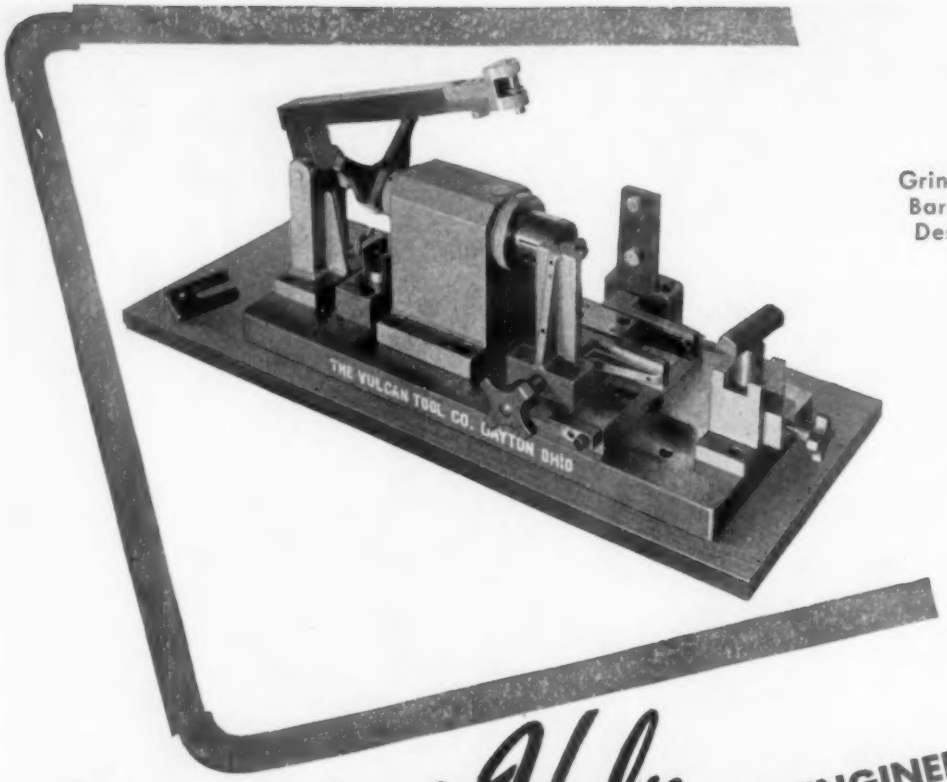

Grinding and Chucking Fixture, Barrel Extension 37 mm Gun. Designed and Built by Vulcan.

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If more dies, jigs and special tools are required for your war production we can help speed the designing now. If it's the special tools of your post war production you are thinking of, Vulcan can start now with the engineering of plant layout and production method; and design the special tools that will be required. We anticipate that an increasing share of our tool making capacity will soon be released for building peacetime tools. Send for the booklet illustrated. Check up on Vulcan's growing reputation, and let's plan today for tomorrow's achievements.

✓ Ask for the brochure illustrated. It will acquaint you with Vulcan's experience, facilities and services.

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NICKEL AIDS THE MACHINE TOOL INDUSTRY

to KEEP 'EM WORKING!

Everyone marvels at the speed of American production for war . . .

But how many realize that much of the credit should go to machine tool designers?

They are the ones who created the *tools* for doing the job.

They're making production miracles commonplace . . . with the most efficient machine tools that ever whipped raw material into finished product.

And the secret? For one thing, they try to design each component part of a machine so that it outlasts the machine itself.

They know that failure of a single machine in a mass production setup might bring whole assembly lines to a stop.

So they lean heavily on Nickel alloyed materials for the critical parts of machine tools.

Over the years they have learned that Nickel contributes toughness, strength, and fatigue resistance . . . properties vitally essential to many different kinds of tool parts . . . from grinder frames to tail shafts, from gears and spindles to drill chucks and lathe beds.

In the industries which use machine tools, it's an axiom that "a little Nickel goes a long way" to keep 'em working.

Whatever *your* industry may be . . . if you want help in the selection, fabrication, and heat treatment of alloys . . . we offer you counsel and data.

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KEEPS PRODUCTION EQUIPMENT *Producing!*

Die cast parts supplied to several foremost manufacturers of quality products call for molds of extreme precision. Likewise, production schedules demand that all equipment be kept in efficient operating condition. Between these two classes of work, the progressive die caster finds numerous and varied jobs for his Dumore Precision Grinder.

Shown mounted on a lathe, it is grinding the plunger of a die casting machine. It is equally at home on milling machine, shaper and other standard machine tools, for either external or internal grinding. Its vibrationless operation and high speeds, (up to 42,500 r. p. m.) make it especially useful for internal grinding of small diameters. Scientific engineering and exacting manufacturing methods give the Dumore stamina to maintain precision to a tenth (.0001"), even in tough production schedules.

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SOLD BY AUTHORIZED INDUSTRIAL DISTRIBUTORS IN ALL PRINCIPAL CITIES

SIMPLICITY + ADAPTABILITY

Owners of Oster "RAPIDUCTION" Lathes employing women operators to replace former male operators, now in the Armed Forces, are high in their praise of the SIMPLICITY and ADAPTABILITY of Oster Lathes. These modern machines have no complicated features to confuse inexperienced people who learn rapidly to maintain high standards of accurate workmanship on Oster "RAPIDUCTION" Lathes.

The SIMPLICITY and ADAPTABILITY of Oster "RAPIDUCTION" Lathes combined with their accuracy and ease of operation are advantages that explain the continuing demand for these popular machines. In the transition from production for war to production for peace, the advantages of Oster "RAPIDUCTION" Lathes will continue to be important factors in maintaining efficient, low cost production in metal-working plants.

OSTER

MEMO

Commitments on definite delivery dates for Oster "RAPIDUCTION" Lathes are impossible to make under existing conditions but complete information will be furnished promptly. Plan NOW for future needs which may arise sooner than you, or we, anticipate.

"Rapiduction" LATHES

THE OSTER MANUFACTURING COMPANY, 2063 EAST 61st ST., CLEVELAND 3, OHIO, U. S. A.

The big battery of modern screw machines in this plant produces several different types of aluminum aircraft parts with the help of Gulf Cut-Aid. In the lower photo a Gulf Service Engineer (right) is shown consulting with the plant Superintendent on machining aluminum caps.

"With Gulf Cut-Aid we increased aluminum cap production 25% —— tool life over 100%"

says this Superintendent

GULF CUT-AID does a better job on aluminum than any other cutting fluid we've ever used," says this Superintendent. "With this outstanding new cutting oil we stepped up production of aluminum caps 25%, increased tool life well over 100%, and are getting better threads."

Gulf Cut-Aid consistently shows better results in cutting aluminum and other nonferrous metals!

In addition to its superior performance on this class of work, Gulf Cut-Aid has another important function—it's an effective energizer for other cutting oils, regardless of type or viscosity. When blended in the proper proportion with other cutting oils, depending upon job requirements, the use of Gulf Cut-Aid makes possible higher production speeds and results in improved finish, longer tool life, or both.

Call in a Gulf Service Engineer today and let him show you how Gulf Cut-Aid and other Gulf quality cutting oils can help you with your production problems. Write, wire, or phone your nearest Gulf office.

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FOUR STYLES EX-CELL-O BROACH SHARPENING MACHINES

No. 80 Small Machine for Round Broaches
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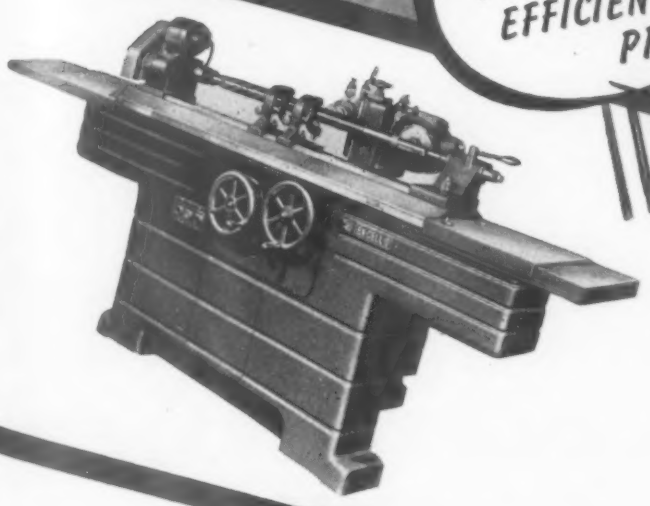
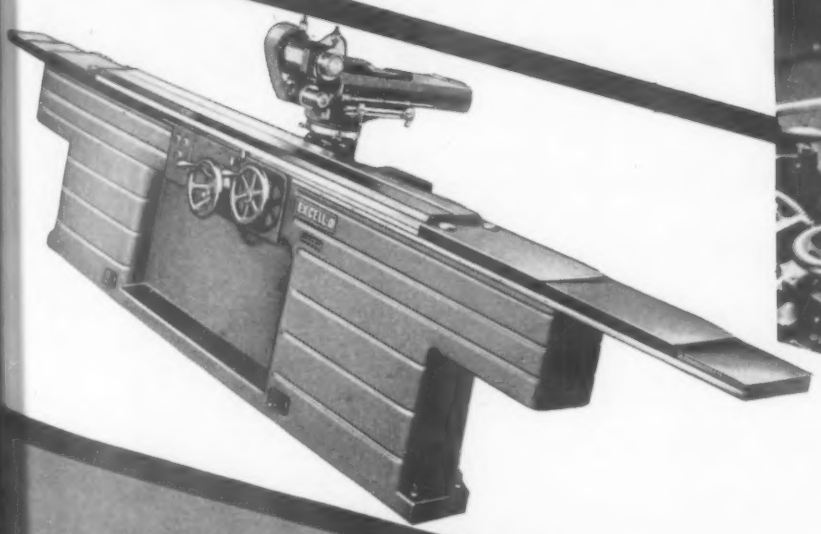
For further information, write to Ex-Cell-O Corporation, 1200 Oakman Blvd., Detroit 6, Mich., and ask for specifications on new Ex-Cell-O Broach Sharpening Machines.



EX-CELL-O—STYLE 80

For economical sharpening of round broaches. Has heavy base and sturdy, well-supported table. EX-CELL-O precision ball bearing spindle assures freedom from vibration, maximum service life and a good grinding finish. V-belts and 3-step pulleys allow a practical range of work speeds. Push button controls are on front of the machine.



EX-CELL-O—STYLE 81-L

For sharpening flat broaches and grinding straight slots, keyways, and grooves to close tolerances. The cross travel of the spindle is manually operated. Adjustable stops are provided so that spindle travel in either direction can be accurately limited when necessary. Ex-Cell-O broach sharpening machines have been in use in Ex-Cell-O plants.

MANY years of experience in the production of broaches, broaching fixtures, and precision machine tools form the background for the design and manufacture of Ex-Cell-O broach sharpening machines. Each machine is built to give the utmost in speed, accuracy, and economical production. Each combines simplicity and ruggedness in construction, with modern streamlined appearance. These new Ex-Cell-O broach sharpening machines are special purpose machines. They are ideal for large production set-ups, and are advantageous also for occasional work. By the use of Ex-Cell-O broach sharpening machines, set-up time is highly minimized, the hazard in changing equipment is practically eliminated.

EX-CELL-O CORPORATION
DETROIT 6, MICHIGAN

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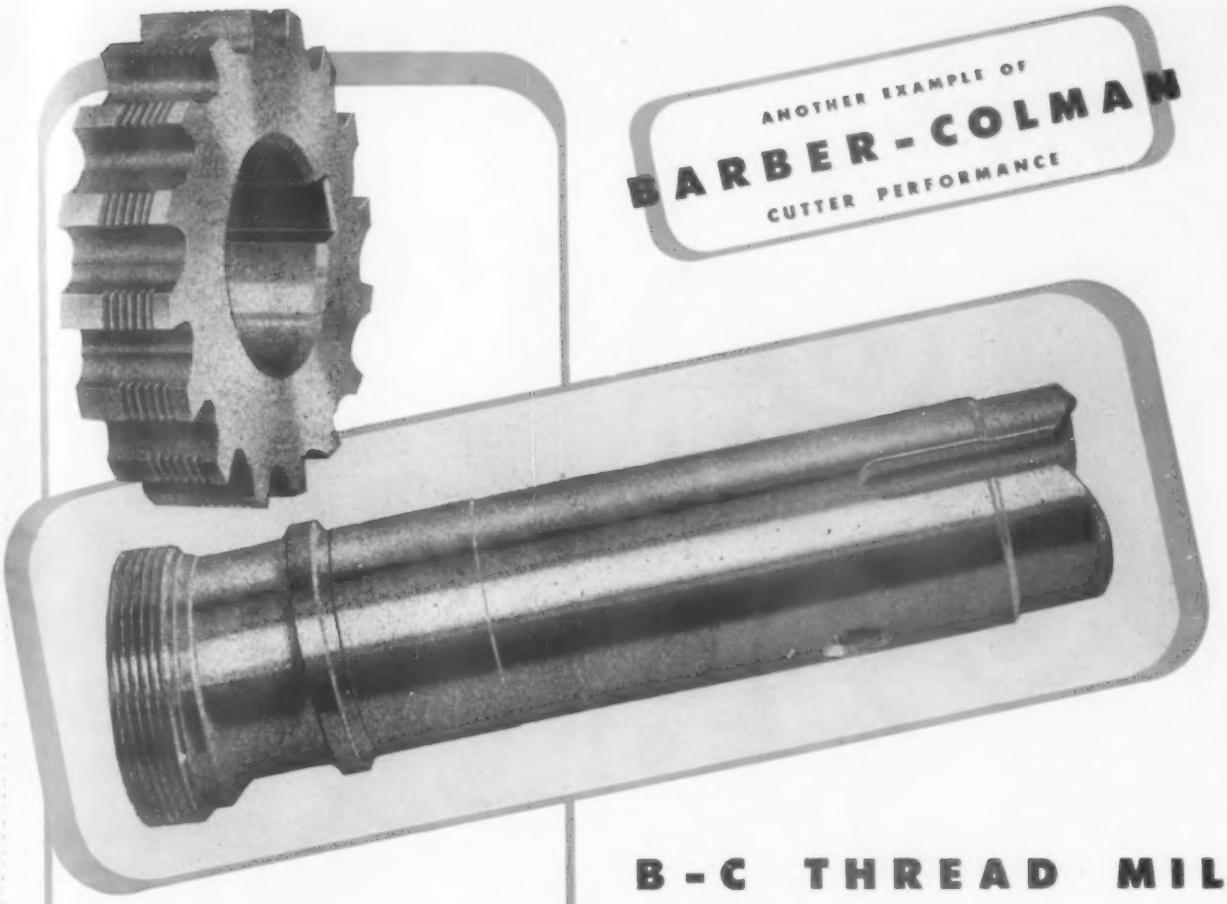

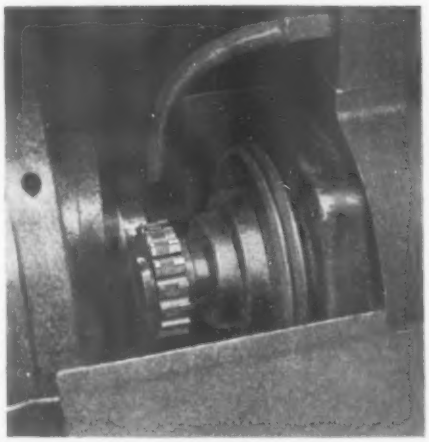

B-C THREAD MILL COMPLETES 1 PIECE EVERY 54 SECONDS

Barber-Colman Ground Thread Milling Cutters, held to class III limits, are used for threading the end of this aluminum valve tappet guide for well-known aircraft engines. Cutting at 550 r.p.m., they are producing 520 pieces every 8 hours. Complete floor-to-floor time is 54 seconds per piece. The cutters are sharpened about once a week, averaging 2500 pieces per grind, but some have run as high as 4800 pieces per sharpening. The piece is held in a special air-cylinder-operated chuck. *Where accuracy, finish, and high production are required—use Barber-Colman Cutters.*

Pictures above show the cutter, the piece, and the set-up. The set-up uses a special chuck holding the piece at an angle so the threads are in the proper position with respect to the cutter.

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Barber-Colman Company

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Precision Straightening at a finger-tip touch

Wing spars for the famous Douglas Bombers are straightened on Hannifin presses.

Douglas bomber production depends upon many thousands of precision operations like this one of straightening long spar caps. This job on a Hannifin 100-ton hydraulic press is fast and accurate, as control is reduced to its simplest terms. The operator has any required ram pressure up to full 100-ton capacity available at a finger-tip touch. This delicate control makes it easy to put the correct pressure in the right place for precision straightening at a fast production pace.

Hannifin hydraulic presses with the exclusive sensitive pressure control are built in a wide range of standard types, 5 tons to 150 tons, for straightening, press-assembly, forming and similar work. Write for press bulletins, or consult Hannifin engineers.

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HYDRAULIC PRESSES

PRODUCTION PERSPECTIVES

WAR SURPLUSES: On October 1, WPB relinquished its job of redistribution and disposal of materials, machine tools and industrial equipment. RFC and Procurement Division, Treasury Department, now handle the task....Final procedure for disposing of the estimated $105,000,000,000 in war surpluses is yet to be established. W. L. Clayton's SWPA operates only by executive order. Legislation passed by Congress provides for a Surplus Property Board of three men appointed by the President.

MACHINE TOOLS: Continuing their long skid downward, shipments and new orders dropped during July to the lowest monthly total since July, 1940. Shipments fell 18.2 per cent; new orders dropped 33 per cent....Early reports indicate continued declines in August....Talk persists of machine tool industry plan for freezing war-built equipment, re-selling it through original builders who would refurbish and modernize it before delivery.

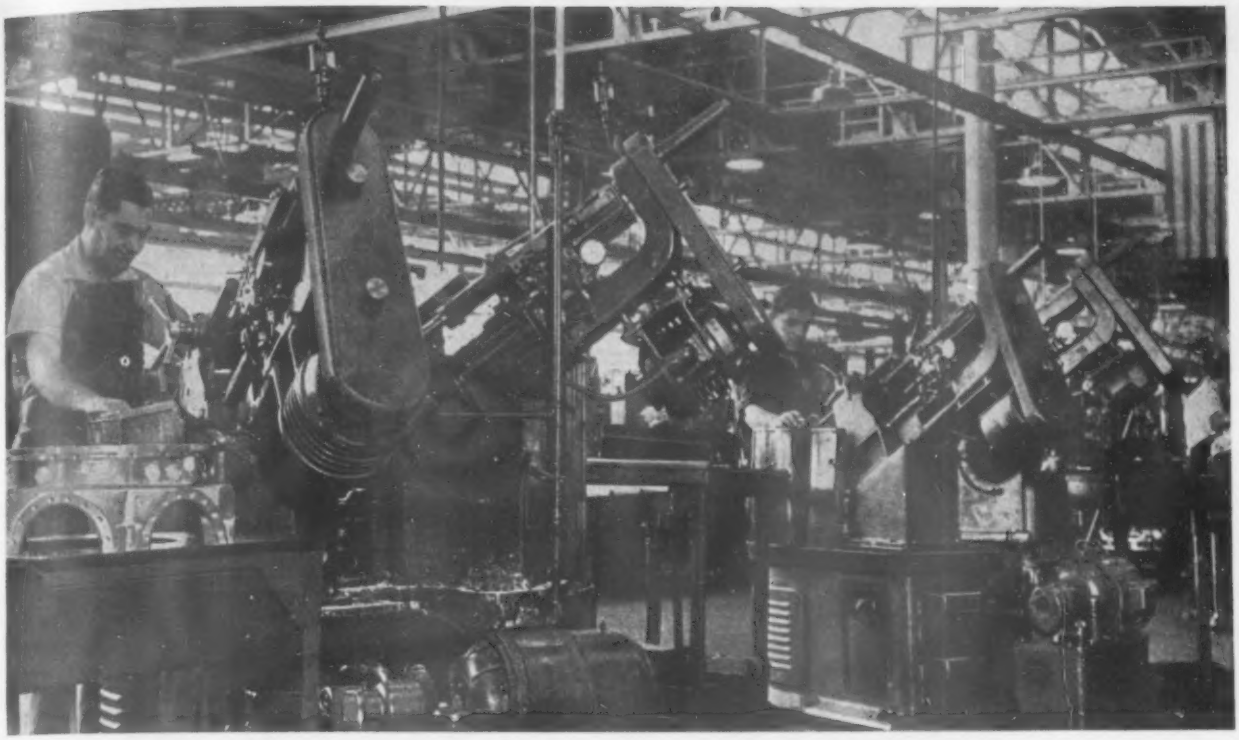
POSTWAR ORDERS: First unrated "postwar" orders for machine tools came from auto builders, called for special equipment almost exclusively....WPB screened out standard units and others obtainable from Government surpluses. Still restricted to work on war orders, builders are unable to promise satisfactory delivery dates....Charge is being made that many Lend-Lease orders machine tool builders are required to fill first are not for military use, but for foreign postwar civilian production use.

OUTLOOK: Through no fault of its own, the machine tool industry may become a reconversion bottleneck. Government failure to give builders a green light on unrated orders will prevent rapid return to limited auto output, will aggravate reconversion unemployment....Pushed by industries in need of "critical" machines for civilian production, WPB-WMC officials are considering reconversion manpower privileges for machine tool builders.

WAR PRODUCTION: Publicized reports of substantial increases during August in "must" programs overshadowed declining output and cutbacks in many categories. ...Output of critical items showing August gains were: tanks, 18 per cent; construction equipment, 13 per cent; crawler tractors, 17 per cent....Cutbacks between June 15 and September 1, total 407, were valued at $421,493,000.

RECONVERSION: Washington plans are still in the blueprint stage, with indications that the Armed Forces are ahead of civilian agencies in preparation for European "V-Day"....Byrnes reconversion report made good newspaper copy, poor material for industrial planning. Men who must reconvert industry say it smelled "political"....Record of Washington promises on end of European war: 40 per cent cutback in war production, mostly for the Army; freeing 4,000,000 war workers for civilian output; termination of all manpower controls except 48 hour week in war plants; elimination of all material controls except priorities on Japanese war production requirements.

MATERIALS: The outlook in metals has brightened again, with substantial tonnages of steel tentatively allocated for early civilian use....With war demands for aluminum and magnesium dropping monthly, cutbacks in output continue. Faced with huge war-built capacities for both metals, the Government is trying to stimulate new civilian production uses....WPB announcement that 100,000 tons of carbon steel and 25,000 tons of alloy steel would be available for 4th quarter civilian use caused little industrial rejoicing. The auto industry alone normally uses 1,500,000 tons per quarter - only 18 per cent of the total national consumption in peacetime.



Two-way, dual-spindle drilling machines helped Chevrolet meet production goals (see box below).

PRODUCTION PLANNING

Reconversion to private production enterprise will place new emphasis on process engineering, particularly where high precision and high production are involved. A practical production engineer reviews steps to planning which recognizes and solves problems before tools are designed

OSCAR M. DIEGERT

TOOL AND PROCESS ENGINEER
ROCHESTER PRODUCTS DIVISION
GENERAL MOTORS CORPORATION

SOUND, PRACTICAL production planning demands knowledge of the application and the limitations of all types of machines to modern manufacturing methods. In its best sense, it is known in most plants as process engineering, and includes working familiarity with tool designing, heat treating, plating, and a thorough understanding of gaging and tolerances.

In planning a production sequence, or in re-tooling any phase of an operation, the process engineer considers multiple machining operations as they affect the following factors:

Cost estimating
Tool designing
Gaging (sizes)
Machine layout (tooling, equipment)

To provide accurate information on the relation of operations to these factors, it is obviously necessary to plan jobs by means of a breakdown analysis. Such a breakdown is required to supply figures relating to the cost of tools and gages, and to the machines that are required to produce the quantity of parts specified.

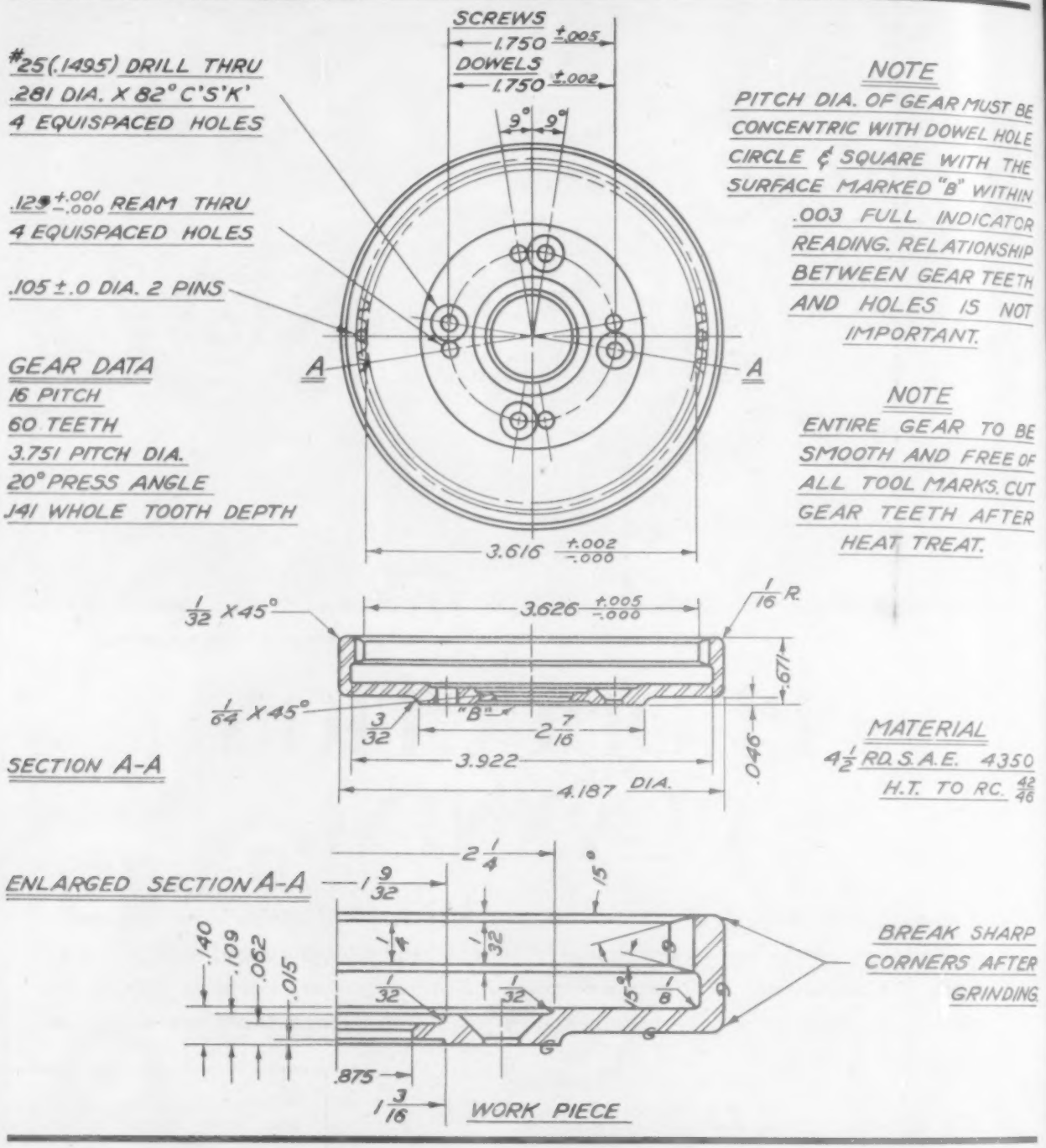
In making operation lineups, gag-

● Special purpose machinery like that shown above has helped Chevrolet meet steadily mounting production requirements.

Process engineering determines whether such equipment is economical in view of the overall production setup.

These two-way, dual-spindle machines were designed to drill oil holes connecting valve tappet guides. This work is done in a Chevrolet plant where crankcase sections are machined for the Pratt & Whitney aircraft engines produced by this General Motors division.

The engine has been one of the division's major assignments in war production.



ing sizes, location or register points, and types of machines to be used must be determined. From this information, rational tool designing can be initiated. Then, with the tool designs agreed upon, it is possible to furnish department foremen, and machine setup men with facts concerning the type of machinery involved, sizes to make the workpiece, tools and gages to be used, the sequence of operations, and an estimate of machine cycle time. Such information can be provided on analysis sheets.

Alert process engineering will follow progress of the workpiece through the tool designers hands, and through the factory. It will not permit changes in location points or in the sequence of operations without consideration for all factors involved. At the same time, the process engineer welcomes suggestions for improvement, and acts upon them in accordance with the effect of their application.

PROCESS ENGINEERING is especially necessary for economical precision work and high production. It eliminates waste and inefficiency caused by confusion in the design and use of tools and gages. Adoption of a production economy which includes this type of engineering means abandoning expensive cut and try methods which result in scrapping semi-processed parts, losing manhours, and causing excessive redesign of tools and fixtures. A good job of process engineering recognizes ahead of time the problems involved in machining raw material into a highly precise product.

Planning the fabrication of finished parts from raw material, in accordance

FACTORY WORK PIECE (OPERATION) SHEET

1	Rgh. drill A & spot drill H Rgh. face ZC & rgh. form D & Rad. CB 3/32 Chamfer CA .031 max. x 45° Counterbore A & face ZA & ZH Chamfer CC 1/64 max. x 45° Breakdown at ZD—drill H Ream H—Rgh. C'bore F—Face ZF Rad. CD 1/32—Cutoff at ZD	DEPT. A Mult. Spindle Au. Screw Mach. Tooling Layout Tools and Gages
1A	Magnaflux—Inspect (Check for cracked bar stock)	DEPT. Z Test Fixture
2	Stress—Anneal	DEPT. B Furnace
3	(Locate on bore A against face ZA Semi finish face ZC & ZD—Form dia. D—Rad. CB 3/32—Finish recess G & ZG. Semi finish turn B & chamfer CA 1/64 x 45° (Face ZG must be smooth)	DEPT. A Turret Lathe Tooling Layout Tools and Gages
4	(Locate on Dia. B against face ZD) Finish face ZA & chamfer CC .041 x 45° Finish bore recess C—Rad. CN & CE Finish bore H—Finish face ZF Form CD & CF—Semi finish bore A Finish face ZE & dia.—E—Form Rad. CG 1/32 Finish face ZH—Finish form CD—CH—CJ & CE (ZA—C—CD—CE—ZF—ZE—ZH—CH must be smooth)	DEPT. A Turret Lathe Tooling Layout Tools and Gages
4A	Polish C—CE—CD—CH (when necessary)	Buffing Jack
5	Grind dia. B	DEPT. C Centerless Gdr. Guide bar Guide block Gages
6	(Locate on Dia. B against face ZC) Rough cut gear teeth CK	DEPT. F Gearshaper Cutter Fixture Gages
7	Heat treat RC 42/46 (Hdw. & draw)	DEPT. D Furnace
8	Grind B to remove warpage only—to size for fixture	DEPT. C Centerless Gdr. Same gages Op. 5
9	Spot drill & drill (4) holes CL and (4) holes CM—Ream (4) holes CM—(Locate on Dia. B—face ZH)	DEPT. E Drill Press Drill Jig Drills Reamer Gages
10	Grind face ZD Locate face ZH and hole H	DEPT C Rot. Surf. Gdr. Gages
11	Grind face ZC—blend to radius CB and dia. D	DEPT. C Rot. Surf. Gdr. Gages
12	C'sink (4) holes CL	DEPT. E Drill Press Fixture C'Sink Gages
13	Finish grind dia. B (Locate holes CM—face ZA & ZD)	DEPT. C External Gdr. Arbor Gages
14	Finish grind bore A Locate on dia. B and face ZC	DEPT. C Internal Gdr. Fixture Gages
15	Finish cut teeth CK	DEPT. F Gear Shaper Fixture Cutter Gages
16	Remove burrs and all sharp edges	DEPT. G Bench Hand Op.
17	Magnaflux & Inspect	DEPT. Z Test Fixture
18	Mark Part Number on Face ZA	Bench Electric Pencil

with the production drawings, requires definite methods of analyzing or breaking jobs down. Four phases of activity are involved in such an analysis. These are:

● 1. A complete study of the production part prints should be made, taking special note of:

(a) specification of material and machinability

(b) heat treat, plating or special treatments

(c) material condition, i. e., bar stock, forging, etc.

(d) important dimensions, as indicated by end use

(e) finish required on surfaces

(f) tolerance specifications

● 2. If possible, the production requirements should now be determined, including probable total production and the production required per day. These requirements will determine largely the type of tools and machines needed.

● 3. The different operations, and the sequence, can then be specified on work sheets. Consideration of machine limitations is important to the success of this endeavor.

● 4. Drawings of each step can be made to assist in visualizing the various operations. Certainly, they will facilitate the determination of locating points and gaging sizes which will provide a proper amount of working stock for each succeeding operation.

PROBABLY the most difficult part of process engineering, or job analysis is the "balancing" of toler-

WORK CHECK SHEET
Diameter Breakdown Analysis

Bold face = Material removed

DIAMETER	OP. NO.	
A		
Finish Grind	14	3.626 - 3.631
		.015 - .024
Turret Lathe Bore	4	3.607 - 3.611
		.043 - .067
Screw Machine	1	3.544 - 3.564
B		
Finish Grind	13	4.1865 - 4.187
		(Close tolerance for location "Finish Cut Gear")
		.0095- .011
Semi Finish Grind	5 & 8	4.1965 - 4.1975
		(Close tolerance for location "Roush Cut Gear")
		.0065- .0135
Turret Lathe turn	3	4.204 - 4.210
		.057 - .073
Screw Machine	1	4.267 - 4.277
C		
Turret Lathe Finish	4	3.922 - 3.927
D		
Finish Grind	11	2.427 - 2.447
		.011 - .051
Turret Lathe Turn	3	2.458 - 2.478
		.012 - .052
Screw Machine	1	2.490 - 2.510
E		
Turret Lathe Finish Turn	4	2.240 - 2.260
F		
Turret Lathe Finish Turn	4	1.271 - 1.291
		.043 - .083
Screw Machine	1	1.208 - 1.228
G		
Turret Lathe Finish Turn	3	1.177 - 1.197
H		
Turret Lathe Finish Bore	4	.870 - .880
		.048 - .068
Screw Machine	1	.812 - 8.22

WORK CHECK SHEET
Final Check Analysis

Bold face = Part Dwg. Size

Operation Number		
	.671±.005	
4	.679 - .683	Turret Lathe
10	.013 - .007	Grind (ZD)*
	.666 - .676	
	.046±.005	
10	.139 - .141	Grind (ZD)**
11	.098 - .090	Grind (ZC)***
	.041 - .051	
	.015±.005	
3	.023 - .027	Turret Lathe
10	.013 - .007	Grind (ZD)*
	.010 - .020	
	.062±.005	
10	.139 - .141	Grind (ZD)
3	.081 - .075	Turret Lathe
	.058 - .066	
	(.062±.004)	
	(see Note below)	
	.109±.005	
10	.139 - .141	—Grind (ZD)
4	.034 - .028	
	.105 - .113	
	(.109±.004)	
	(see Note below)	
	.140±.005	
10	**.139 - .141**	
	(.140±.001)	

*Material removed at grind ZD, Op. No. 10.
**Locating on Face ZH makes it necessary to dm.
***Grind ZC as shown, however the resultant gives drawing size.
NOTE: As the .015—.062—.109 dimensions are controlled by the amount of material removed at ZD on Op. No. 10, it is necessary to hold Op. No. 4 ZH to ZD on turret lathe to .148—.152 and grind ZD Op. No. 10 to .139—.141.

WORK CHECK SHEET
(Length Breakdown Analysis)

Bold face = Material removed

SURFACE ZA
Turret Lathe finish face

Op. No. 3	.713 - .719	
Op. No. 4	.683 - .679	
	.030 - .040	

SURFACE ZH
Turret Lathe finish face

Op. No. 3	.713 - .719 .048 - .044		
Resultant	.665 - .675		
Op. No. 1	.531 - .511	Op. No. 4	.148 - .152
Resultant	.134 - .164	Op. No. 3	.048 - .044
	.108 - .100		.100 - .108*
	.026 - .064	Op. No. 11	.098 - .090
			.002 - .018

SURFACE ZF
Turret Lathe finish face

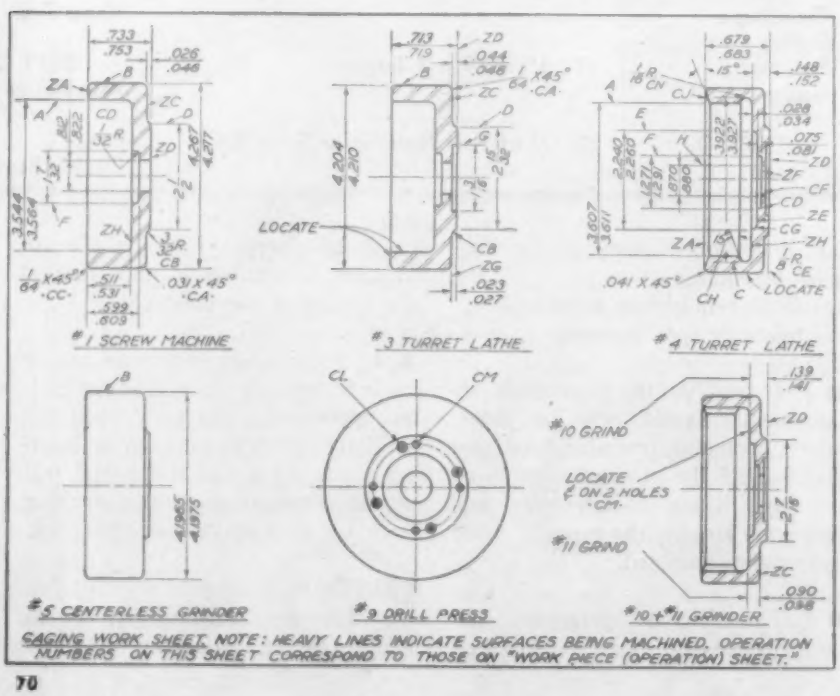
Op. No. 3	.713 - .719		
Op. No. 1	.609 - .599		.148 - .152
Resultant	.104 - .120	Op. No. 4	.081 - .075
	.077 - .067		.067 - .077
	.027 - .053		

SURFACE ZC
Finish grind face

*Op. No. 3 & 4	.100 - .108		
Op. No. 11	.098 - .090		
	.002 - .018		
	.733 - .753		
Op. No. 1	.046 - .026		
Resultant	.687 - .727		
Result Op. No. 3	.675 - .665		
	.012 - .062		

SURFACE ZD
Turret Lathe finish face

Op. No. 3	.713 - .719		
Op. No. 1	.609 - .599		.081 - .075
Resultant	.104 - .120	Op. No. 4	.148 - .152
	.077 - .067		.067 - .077
	.027 - .053		



GAGING WORK SHEET. NOTE: HEAVY LINES INDICATE SURFACES BEING MACHINED. OPERATION NUMBERS ON THIS SHEET CORRESPOND TO THOSE ON "WORK PIECE (OPERATION) SHEET."

ances and floating surfaces. Each of the four phases of process study are affected by this consideration, and results of each division of the study bear in turn upon this factor of job analysis. The fourth step bears most importantly upon it.

Balancing the operations is best performed by working backward from the finished part. Starting with the product of the last operation, add the necessary material for the previous operation, and continue this calculation back to the raw stock. Each consideration, however, includes regard for a balance of tolerances, in line with practicality and machine limitations. The drawings accompanying this article clarify in detail the method used to handle the intricate problem of balancing tolerances, and determining floating surfaces.

THE END

HIGH PRODUCTION WITH RADIAL DRILLING MACHINES

West Coast shop speeds extensive drilling and boring operations with ingeniously designed jigs and fixtures. Skill requirement is low

JEROME S. WILFORD
ASSOCIATE EDITOR

OF ALL machining operations performed in the average shop, the majority are concerned with producing or finishing holes. The Pacific Car & Foundry Company of Renton, Washington, manufacturing logging hoists and tank retrievers, may do even more than an average amount of drilling in machining steel castings on a production basis. Intelligent and economical tooling for these jobs has enabled them to amortize a large investment in radial drills.

Production lots are large enough to warrant tooling, but not large enough to permit purchase of single purpose equipment, or even the required number of less expensive, but limited range, standard machines which might be applied conventionally. Combined with fixtures produced in the tool room, the use of radial drills affords necessary flexibility and a high degree of production economy.

At present, this shop is equipped with 14 radial drilling machines, including four 4′-11″ machines, six 5′-13″ units, and four 6′-17″ units. Engineers are making the fullest use of the versatility of the equipment, even to employing drilling setups and machines for boring operations.

ALLOYED FOR TENSILE STRENGTH

Both logging hoists and tank retrievers, though performing in different fields of action, are built up from heavy cast members and plate. Both are subjected to heavy loads and tough operating conditions. Castings produced by Pacific Car & Foundry are alloyed to contain fairly high amounts of copper and manganese, and low carbon. The result is a material of tensile strength running a little better than 100,000 psi, but with favorable ductility. Cutting speeds, with high speed steel, are comparable to those normally used on SAE 3140, or about 45 to 50 sfpm.

Though difficulties of using carbide drilling tools are obvious where casting irregularities are a possibility, carbides have been used economically in boring. The production advantage outweighs the maintenance factor in these applications.

Most products of this plant must be machined accurately to assure even distribution of load concurrent with the imposition of rapid stress application. Tolerances rarely exceed .003″ to .005″.

In addition to maintaining accuracy, the principal factor in tooling to machine heavy castings concerns reducing the required movement of the parts from one machine to another, or from one fixture to another. Use of tilting tables is supplemented wherever possible by the application of trunnion fixtures, designed and built in the tool room.

Weight of most of the castings, and the need to hold machining to relatively close tolerances has made rugged jigs and fixtures essential. However, production runs such as the average of 150 units a month for the logging hoists, do not permit extensive expenditure. Thus simple jigs, welded up from plate and tubing, with conventional clamps and dowel locating devices must serve for the most part.

In drilling nearly 50 holes in a hoist case, two trunnion fixtures are serving to position the work for complete operations on radial drilling machines. Available on one axis are 26 holes for drilling and tapping. One hole is bored to a 7″ diameter, a ball bearing pilot in the jig guiding the bar. A stop collar on the bar, with a feeler

Trunnion fixtures, designed and built in Pacific Car & Foundry's toolroom, maintain high accuracy and reduce handling of work. Rigidity is required to meet tolerances on heavy castings.

gage supplementing its use to guard against spring in the drill or the work, permits boring to a specified depth within .003". Quick change adapters, such as are used for the regular drilling tools, serve for rapid insertion of the boring bars.

On the second axis, using another trunnion fixture, 22 holes are drilled and tapped.

PRECISE WORK ON HOLES

An interesting comparison to the radial drilling application is afforded in the machining required to produce several holes on a radius for a sprocket hub. The material is SAE 4140, heat treated to 325 Brinell. In this instance, because of the even spacing of the holes, stationary upright machines are most applicable. An indexing fixture, with positive stops, permits rapid production. Hole size is held within .0005", and spacing from first to last hole is held to .002". Drilled undersize, finished accuracy is obtained by reaming.

Though this work on the sprocket hub is perhaps the most precise machining job which this shop performs on castings, almost comparable accuracy is obtained on a radial drill in machining brake spiders of unwieldy shape. Alignment between holes on the same axis must be maintained so closely as to accept pins for holding the brake shoe cams which are machined for a .001" fit.

In preparing the brake spider for the radial drill, a boring operation is performed which establishes a locating surface for quick setup of the part in a stationary jig, the bored surface being set over a pilot. A 2-spindle, two-way boring machine, originally developed for boring out gun cradles, is used. A work-holding fixture, with a template for locating the bore, eliminates need for layout. Close accuracy in casting has permitted this application, resulting in only a few thousandths deviation in wall thickness of machined surfaces.

All holes drilled on radial equipment are related to this bore through the locating pilot on the holding fixture.

In drilling two parallel series of six holes, in a brake shoe, congruent with the radius of the shoe's arc, a trunnion fixture serves both as an accurate work-holding device for changing machining locations, and for maintaining alignment of the work on the constant radius. It also serves to position the work, first through an arc in the upper half of a circle for drilling the outside surface of the shoe, and then through the lower half of the circle to expose the inner surface for spot-facing.

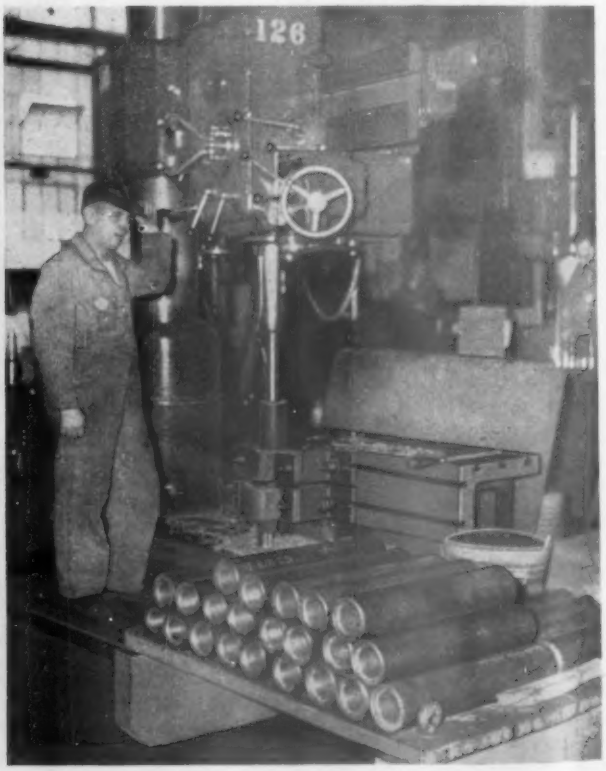
A DIFFICULT BORING JOB

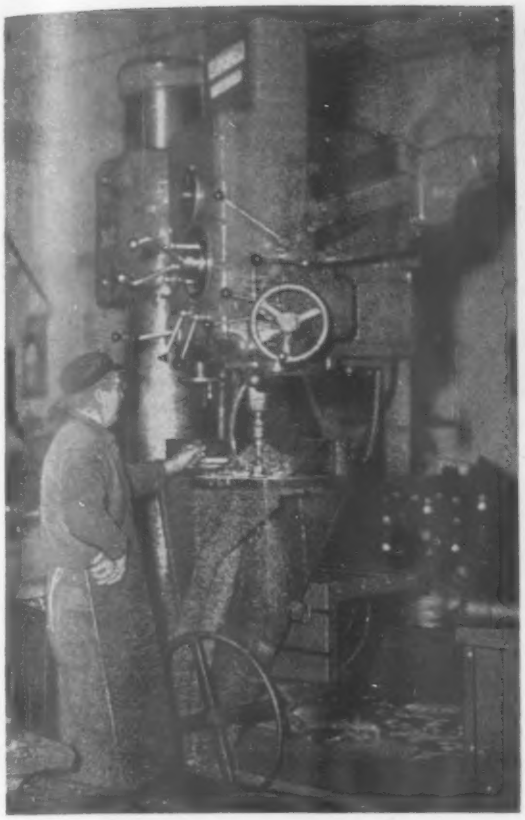
A permanent fixture at the side of a radial drilling machine table is used to hold a 21" tube, for a complete boring job. This job proved difficult for two reasons. Inability to obtain tubing close to finished size meant that in producing a 2-7/8" bore, as much as 7/8" of stock had to be removed on the diameter. Chip removal proved to be a problem in any horizontal setup. Upon setting the job up for vertical boring, a production advantage of two to one was gained. A boring bar equipped with three tools performs the complete operation in one pass. A stainless steel pilot, passing through the SAE 3140 tube has been satisfactory. Automatic feed of .018" on the 5'-13" machine has been obtained.

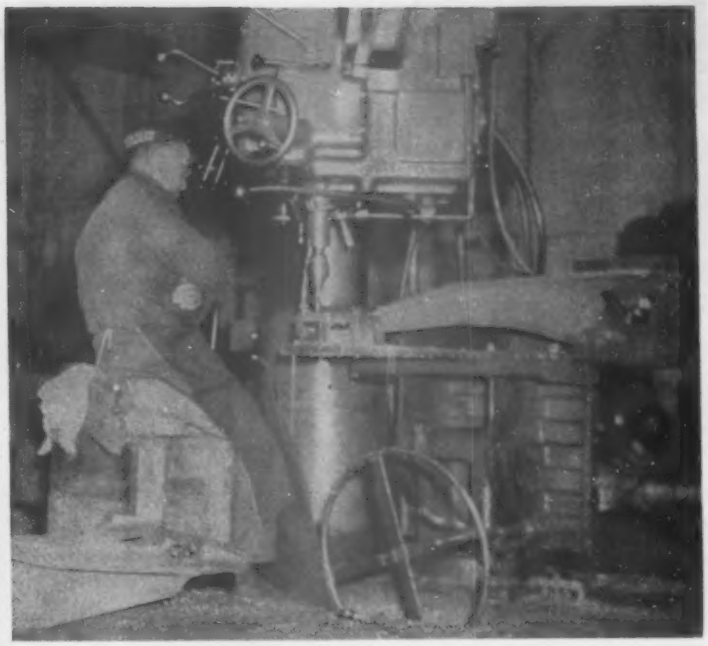
Inaccuracy in drilling through a 4" ring, 24" O. D., was overcome by the application of jigs or drill plates on both top and bottom. Plates are dowelled together to insure alignment. Where run-out prevailed after drill-

Drilling, boring, and tapping operations are completed in single setup for all holes radial from fixture axis.

Complete boring job is performed on 2⅞" bore of 21" tube. Chip removal would be difficult on horizontal setup. Vertical drilling affords a 2 to 1 advantage.







Above:. **Tilting table is quickly and positively moved 90° for second operation on cross-rod. Note awkward shape of workpiece.**

Left: **Cross-rod presents problem of drilling holes in perpendicular planes four feet apart to close relationship. A single tilting fixture does the job.**

ing more than half-way through the 4″ thickness, the condition was readily corrected by drilling half-way through from either side. Complete coordination was built into the jig.

MACHINING AN AWKWARD SHAPE

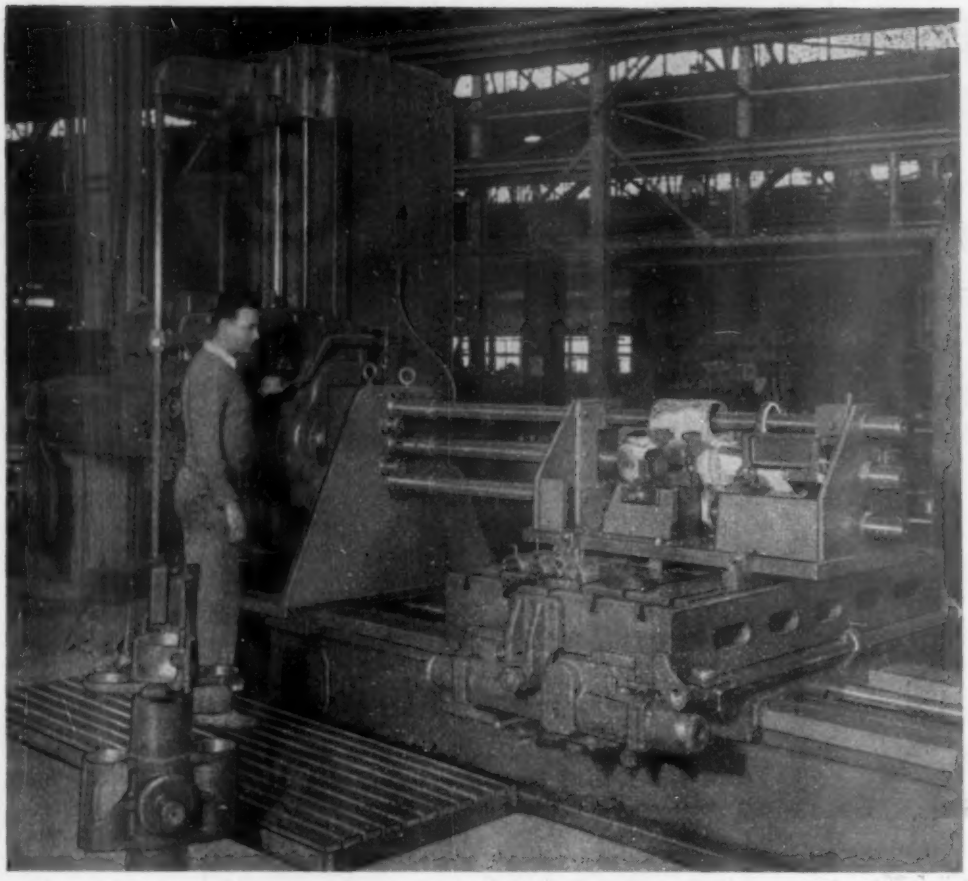
One of the most awkward shapes which Pacific Car & Foundry production engineers had to contend with is the cross-rod for the tank retriever. Surfaces lying in perpendicular planes, approximately four feet apart, must be machined to maintain a definite relationship. In both planing and drilling, work is set-up once for operations on both surfaces. In preparing the surfaces, previous to drilling, the work is rigidly clamped to permit planing from both side and cross-head tool fixtures. Six parts are mounted simultaneously on the planer table.

In drilling on the radial machine, a clamping plate is mounted on a tilting table to maintain the required relationship.

A ball socket is drilled and reamed in a large casting with formed tools. Drilling the 2¾″ holes to a 1½″ depth is accomplished with the use of stop collars on the tool holder, and supplemented with a feeler gage between the collar and the bushed pilot block. THE END.

Below: **Multiple setup of cross-rods on planer and combined use of side and cross-head tool fixtures permits full production in preparing parts for radial drilling job.**

Pacific Car & Foundry photos



MORE OF THESE

A modern, multiple-head 3-bar boring fixture designed by The Baldwin Locomotive Works to machine 75 mm. gun cradles.

Cradle shown in front of machine is used in connection with M-3 tanks.

Equipment such as this gave production engineers opportunity to get full return from investment in tooling.

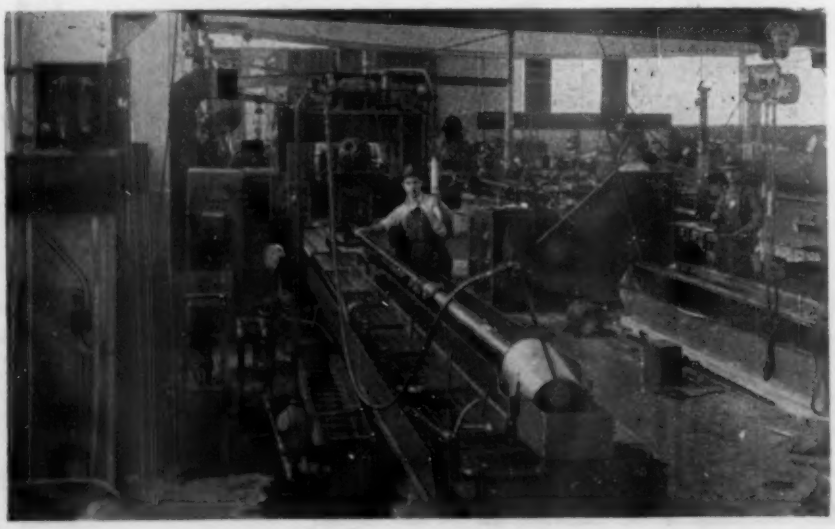
●

STAFF FEATURE

Baldwin Locomotive photos

War Production Lessons

Headwork for a headstart is sought in asking that this country think of industrial as well as military preparedness for war. Our amazing tooling ingenuity should never again be invested in worn or obsolete equipment



WHEN AMERICAN production engineers look back upon their war production achievement, they may well wonder how they did so much in the beginning stages (and to some extent at the finish) with so little equipment designed for the work at hand. Recalling the tough nuts they cracked that "nobody else would take on," there will be reason for pride in the accomplishment.

Now, however, still looking for-

FEWER OF THESE

Because of bottleneck in modern honing equipment, Baldwin Locomotive production engineers produced a machine from an antique planer to hone gun tubes.

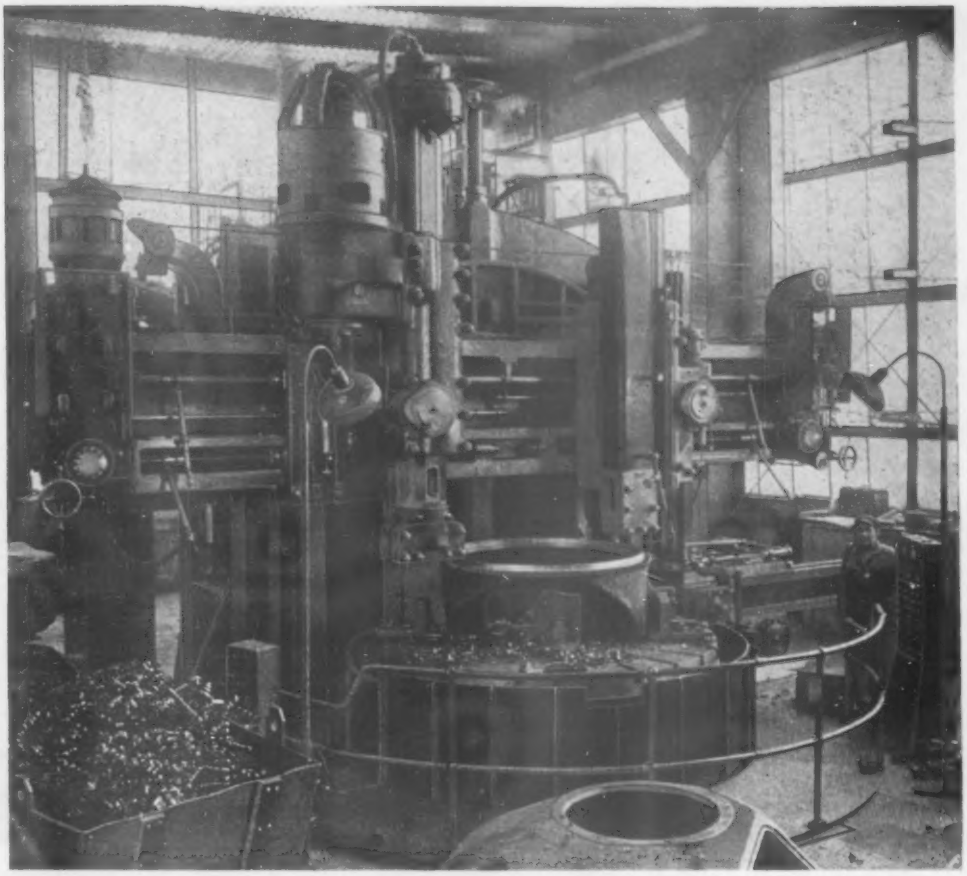
Work proved to be satisfactory. It had to be. Suppose tooling headwork had been available for a headstart such as would have been afforded by ... modern machine.

MORE OF THESE

This 100" boring mill is the type of modern machine which capitalizes on "know-how".

Left-hand head provides for milling and boring off-center. It is also used for turning. Cross-rail with heads weighs 40 tons.

Remote control is provided by master and auxiliary panels. This 201 ton machine has motor equipment developing 200 horsepower.



Must Be Heeded NOW

ward to peace, and still faced with problems, may be the time to heed a lesson. May we not ask, if we could convert plants, men and machines to this record-breaking task, prepared with little more than "know-how", what might our tooling ingenuity have accomplished with more modern machines, with more industrial as well as military preparedness.

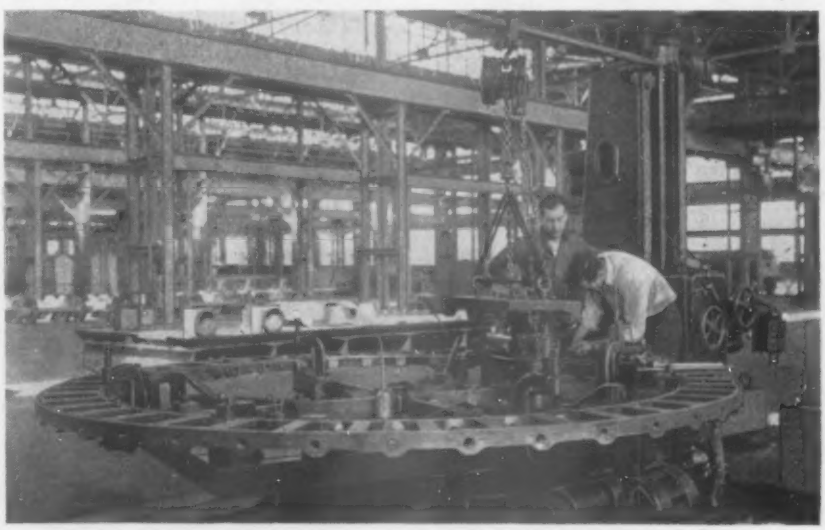
One of the best examples of what had to be done to produce tanks and ordnance equipment when the full impact of the machine tool shortage was first felt is shown in the conversion of equipment by The Baldwin Locomotive Works. With few up-to-date machines obtainable to meet rush demands of an expanded operation, Baldwin's production engineers were forced to muster strength from equipment that had served as many as 35 years.

That they did produce on schedule is a tribute to remarkable tooling ingenuity. It was no mean task to

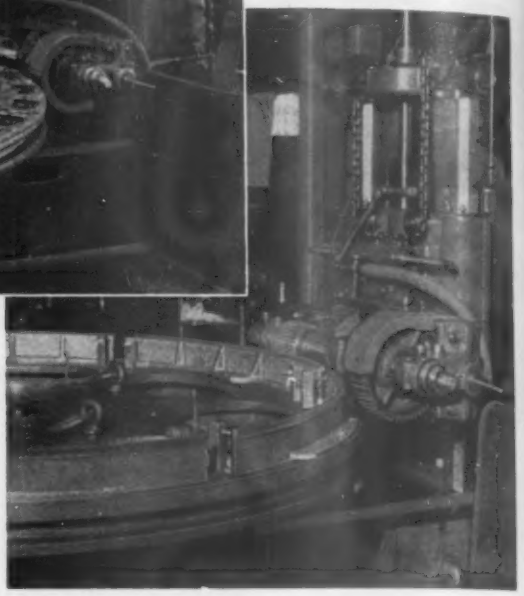
FEWER OF THESE

Much tooling ingenuity was invested in developing a precision fixture that would permit use of an old drilling machine to drill and ream roller pin holes in roller path spacing rings used on railway gun mounts.

Holes must be parallel within .001" in 14", and must be radial to center line within .005" to center. Fixture is shown as hoisted for part inspection.



Left: **Gear generator cutting 1800 teeth in data receiving ring for railway gun mount. Diameter of worm on table is only 40" against 119½" O.D. of cutting teeth, yet a .001" limit is set across cord of teeth.**



***Right:* Closeup of the gear generator used in machining data receiving ring for 8" railway gun mounts. As shown here, it is cutting elevating indicator rack segments for the gun. Six of these segments are machined in one setup.**

tighten up boring machines of 1906 vintage so that they might machine gun-housings for medium tanks. But, what might have been the effect had that ingenuity been applied to realizing full efficiency from modern equipment?

Some indication of the possibilities, where time permitted, and design engineers were available, is shown in the development of a special boring machine. In boring 75 mm gun cradles, a 3-bar boring fixture and multiple head was produced in the Baldwin tool room. This high production setup was supported on the table and column of a fairly modern drilling, milling and boring machine. Bars operated independently for long and short bores. Setup gages permitted quick installation in the fixture to within .001". Tooling ingenuity was applied in developing full efficiency. With less necessity for revamping old equipment, more time would have been available for this type of progressive machine and tool engineering.

When honing equipment could not be obtained in the time required, a setup was developed utilizing an antique planer. In honing 37 mm gun tubes, the spindle was powered from a head suspended from the cross-rail, with the work supported on the table. A deviation from conventional honing practice consisted of generation of reciprocal motion through table travel, concurrent with the turning of the spindle. Again, the ingenuity cannot be disputed. But, again and again, one cannot help but wonder if a degree of national industrial preparedness might be maintained which would make this headwork available for a headstart.

Because Baldwin was able to obtain a modern boring mill, of considerable capacity, with a wide range of speeds and feeds, "know-how" could be applied to getting the most output from a superior machine. The 104" table (60" rail clearance) is powered by 200 hp motor equipment. Actually cuts can be taken that are heavy enough to tear the work off the table. Practically, the rigidity of the fixture and the power permit taking cuts of as much as 1-½" by 1/16 to 3/32" with a 16" feed. The machine is capable of performing to limits of .004" or .005". Remote control is provided through a master panel at one side of the machine, and an auxiliary panel at the other side.

What's to be done? Obviously, full industrial preparedness for war would be as difficult to justify as a standing army of wartime proportions. Yet, war tooling in the engineering stage, and to some extent in actual physical setups, might at least be in step with armaments design as well as with the actual size of peacetime land, sea and air armadas.

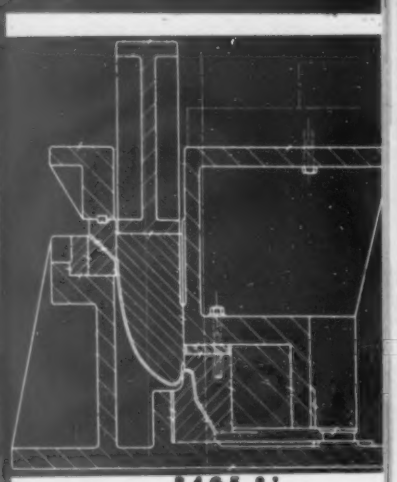
Toward this end, it does not seem illogical if industrial preparedness were to include the solution of basic tooling problems, in keeping with the most modern methods available at the time of the design of a new plane, tank or rifle. In addition, certain production alternatives might be planned in recognition of limited beginning facilities.

Further, there is no reason for the military services' indulgence in "peacetime" designs, if those designs cannot be realized as wartime products. Why wait for war to prove that the confounded things can't be built by mass production methods. Here again, the drawing of a line is difficult, but there are obvious places to draw segments. For example, when the country is in the midst of battle is no time for argument over excessively close tolerances.

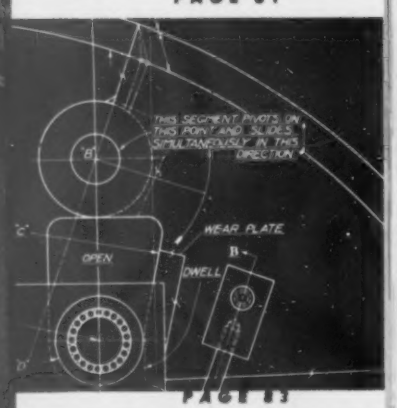
Government arsenals, gross offenders in lack of modern tooling preparedness, might be maintained as modern pilot plants, and as research laboratories whose purpose it would be to determine methods which would provide a degree of industrial preparedness. When all is said and done, with war becoming more and more a matter of technological skill and resource, industrial preparedness may do as much to discourage a potential enemy as the fleet and air force which it is backing. THE END

PRODUCTION

MACHINE AND TOOL ENGINEERING



PAGE 81



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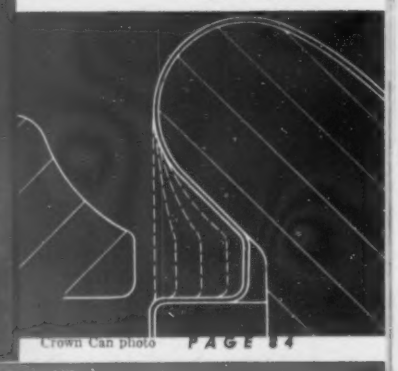


Crown Can photo

PAGE 84

Balanced press operations and sound die design permitted forming aircraft nose cowl components.

COMMON SENSE APPROACH TO FORMING

Precision forming methods have advanced in wartime production to supply more and more close tolerance components for modern mass assembly lines. "Cracking tough nuts" has opened the way to greater production economies and progress for the industrial future

Streamlined Production

Forming Progress Is Based on Fundamental Principles

IN THOUSANDS of manufacturing conferences, American production engineers have sketched, noted and planned the means for more and more output. A major result has been a boom for metal forming methods. In some cases, devices of new design are performing jobs that were not done before. In others, forming has opened the way to new production economy. In many instances, improvements have been simply refinements; in others, the punch press has been drafted for expediency.

The range of experience and development has been extensive. In Akron, aluminum fabrication experts have perfected a stretching machine for producing highly accurate curves in extrusions. In Philadelphia, die designers have brought new efficiency to forming stainless steel. Young tool engineers in Santa Monica, California, have tested "radical" ideas inexpensively with small-scale dies. A New York designer has perfected a machine for producing compound curves in sheet, without tooling and without scrap. A Muskegon, Michigan pump manufacturer has contributed an item of "know-how" in fabricating an intricate shape in brass by punching a hole in a section of the draw which will be scrapped. The hole aids metal flow around an adjacent compound radius.

The thinking which produced these developments has made metal-forming one of the pace makers of wartime industrial progress. Yet the advance has actually been less one of invention and more an education of American manufacturers in principles long known to forming experts.

INDICATING the degree of learning gained from wartime expediency, and the implications of it, is the answer to a question in the *Production Poll of the Metal-Working Industry* (THE TOOL ENGINEER, August). To "Do you see a trend toward reduction in stock removal for finish ... by precision forming ... stretching ...?" more than 75 per cent answered, "Yes."

To a large extent, what is being done today was possible 10 or 20 years ago. Present day reasons for the stride ahead are largely the increased use of aluminum and stainless steel, introduction of new materials such as magnesium, and the development of auxiliary processes such as brazing and welding. One big cause for adapting the ideas which were familiar to such industries as automobile manufacture has been the boost in production schedules.

THE aircraft industry has won much credit in forming progress. In a relatively short time, it has established techniques which place its press work in a stage of advancement comparable to that reached by the automobile body manufacturers. Through the controversy of "soft" versus "hard" dies, plane builders ended up by adapting certain recognized mass production methods, and by developing additional techniques and equipment to meet its own requirements. However, such developments as plastic cast-to-master dies, stretch presses, and bending machines will have broad applicability.

Auxiliary processes which gave impetus to precision forming are brazing and welding. Manufacture of precision formed components which can be brazed or welded into strong, light assemblies was beginning when war stimulated its development.

WITH all the progress, however, there are two aspects of forming which production engineers new to the field must consider carefully before going overboard in sponsoring its application to new jobs. First, just as with any other manufacturing process, there is usually more than one way of going at a job. Before all the up-to-date ways are known, a big project of correlating wartime experience waits completion. When completed, it will present a picture of tremendous accomplishment. In months to come, as previously, this magazine will publish the facts on new or improved processes and developments made by experts. There are "wrinkles" in most processes, depending upon the material, the shape required, and the equipment involved. It is well to know how experienced production engineers have ironed them out. That phase of correlation is naturally part of the overall job of presenting you with the story.

Second, there is good reason to harken back to basic principles—to reduce materials to the common denominator of physical characteristics, to see products fabricated from those materials as geometric shapes which must meet certain requirements. Stretching metal to shape, along with bending it, is not a new idea. Successful deep drawing of most materials has employed stretching principles. Modern stretch presses are but a more convenient way of producing certain shapes.

AS on the battle front, many spectacular gains in industry have been born of flashes of genius, and under pressure of expediency. There have been great risks, and some have resulted in losses which would be figured as unwarranted in other times. But the overall power of the advance has been so tremendous, that there has been little recognition of failures. A consolidation of gains in forming will be achieved by application of common sense to tomorrow's production problems.

The following article on the common sense approach points to the type of work-a-day tough nuts which an experienced stamping company cracks. With long experience as a supplier to the automotive industry, the Heintz company shows the importance of knowing basic principles.

COMMON SENSE APPROACH TO FORMING PROBLEMS

Experience of progressive Eastern stamping company associated with automotive industry indicates that the modern approach to fabricating problems will include broader consideration of forming methods

SPECIAL FEATURE BY THE EDITORS

MORE AND MORE consideration is being given the true economy of tooling in stamping and forming operations. At no time in production history have ideas been so thoroughly proven and tested in this phase of metal working than through these war production months and years. In particular, impetus has been given a variety of methods through the increased aircraft parts requirement, with its tremendous demand for many hundreds of contoured parts.

In March, this year, THE TOOL ENGINEER stated in an article from the Eastern Aircraft Division of General Motors that "dies for aircraft sheet metal should be cheap, the cost of dies is relative to the number of complete parts required... and the more expensive die is (frequently) the cheaper one."

HIGH OUTPUT CHANGED METHODS

In many ways, this seems an obvious statement today, but it should be remembered that when demands for increased aircraft production were first made, this industry had been accustomed to producing only a few planes a year. Drop hammer methods, with considerable handworking, were not only acceptable, but were economical in view of the production run. Even high schedules did not mean much in the face of day to day production changes. In effect, it has not been until recently that the majority of plane models have satisfied military authorities to the point that design stabilization could be counted upon.

Now, with long run production established on many planes and parts, the methods of production so familiar to automotive suppliers are coming in for their share of credit.

Heintz Manufacturing Company of Philadelphia, long a supplier to the automobile industry, has injected a strong note of common sense into consideration of stamping and forming of aircraft and other war product parts. Most of its present day development is based upon its experience with sheet steel body metal; much of its data coming from the "little black book" which similar shops maintain to record solutions to production headaches.

CHEAP TOOLS ARE COSTLY

Though they have undertaken short run production, the engineers in this company are interested essenially in mass production. Therefore, they can afford a maxim, that "cheap tools are usually costly for a long run job." Heintz engineers feel that there is a definite place in the aircraft stamping industry for inexpensive tooling, but the consideration must always be based on the quantities to be produced.

This company's organization includes a Methods and Rate Department which functions in connection with the Tool and Die Department. It is the duty of the Methods and Rate Department to determine whether the part is to be square-sheared, notched and pierced, routed and drilled, or blanked and pierced. Such factors as setup, removing burrs, hand finishing, and parts handling are of course taken into account.

In the jobs which it has taken on, this firm can be credited with introducing "precision forming" in its handling of the work. Much of the common sense attitude toward its job is illustrated in its approach to the forming of aluminum.

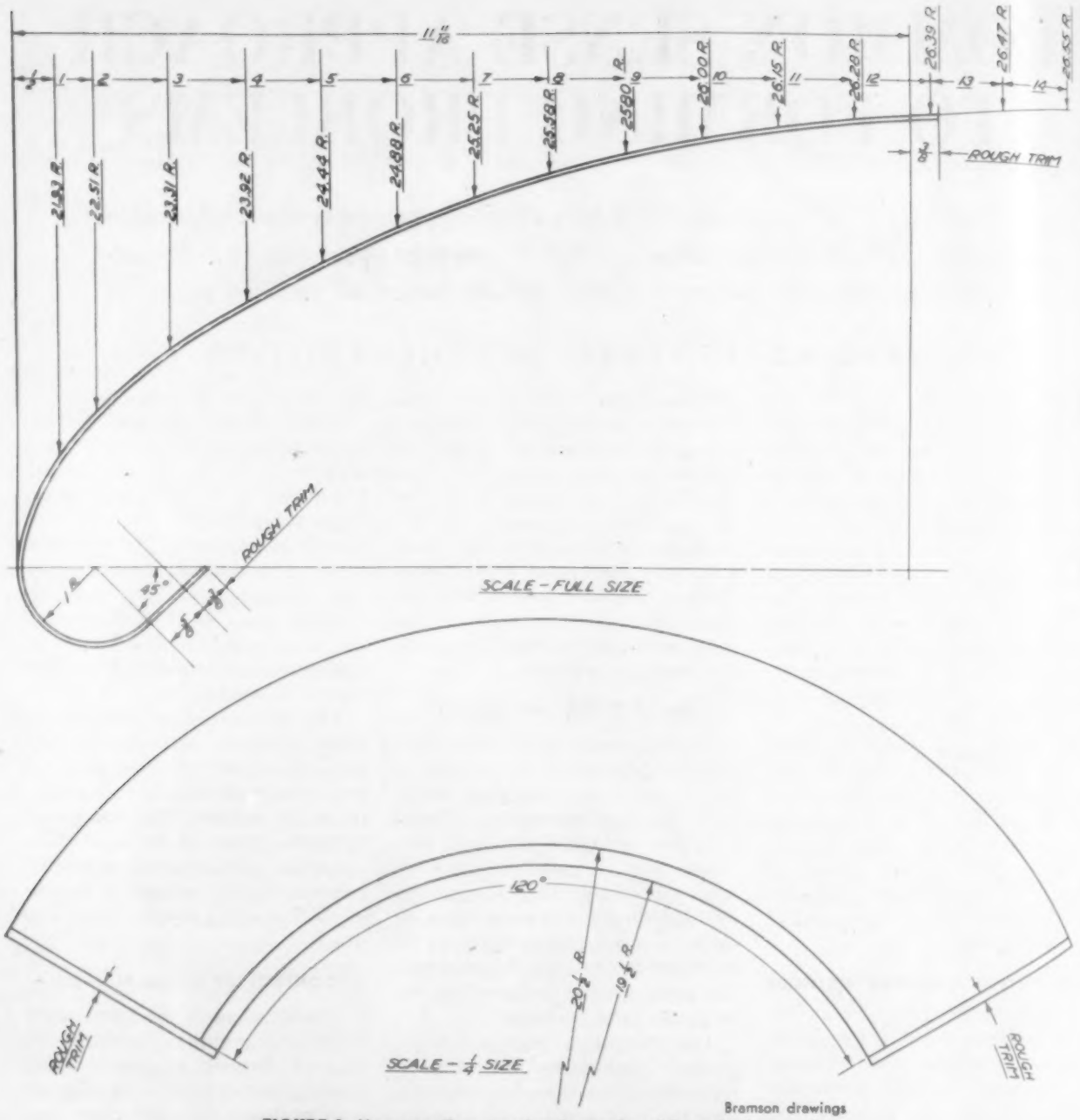
Heintz does not scare easily. When requested to make aircraft cowling stampings, Heintz engineers investigated the materials then used by airplane manufacturers for dies and stretch press forms. One Eastern plant was re-melting aluminum scrap, but comparatively few stampings could be produced by this soft metal before the edges would wear, introducing inconsistency in quality from one run to another.

The introduction of Kirksite resulted in greater consistency, but this material showed definite signs of wear when embossments were present in the die surface. This was caused by the movement of the metal in the stretching or drawing operation. One company finally replaced a number of their forming punches with cast iron.

CONTROL OF MATERIAL FLOW

Another phase of the investigation led Heintz engineers to study the type of forming equipment being used by another plant in forming aircraft cowlings. Difficulties here were traced to the use of drop hammer dies, with little or no effort being shown to control the flow of the material into the stampings.

As a result, the stampings had a considerable number of wrinkles and buckles. This necessitated the use of a trip hammer for straightening, which not only cost additional manhours, but failed to produce consistent shapes. In assembling the formed sheet to stringers, definite gullies were apparent at each rivet, causing rejection, and costing more manhours



Bramson drawings

FIGURE 1. Nose cowling, previously produced by spinning or drop is drawn in four press operations.

for the correction of the deficiency.

The engineers from the Heintz plant advised the use of a double action press, with cast iron dies in which the flow of material might be controlled so that little or no re-shaping of the part would be necessary after the forming operation.

One of the most important aspects of steel stamping, which Heintz has carried with full value into forming aluminum, is that the flow of material must be controlled to prevent formation of wrinkles. Therefore, one of the important things in designing a die is to develop the proper shape in blank holder rings, and to determine the best pitching angle for the punch and die.

Ordinarily, a die designer specifies the use of beads in line with his experience with the forming of similar shapes or contours. Where he meets a new forming problem, a different shape or material condition, he is likely to specify the use of beads in line with what seems to be required. Obviously, he runs the risk that a bead, or a higher bead than specified, will still be required.

An interesting aspect of flow control is illustrated in a departure from this conventional approach to the job. Faced with a difficult die problem, the engineer on the job may specify development of a prominent bead entirely around the blank holder, though it may seem obvious that less height

Streamlined Production

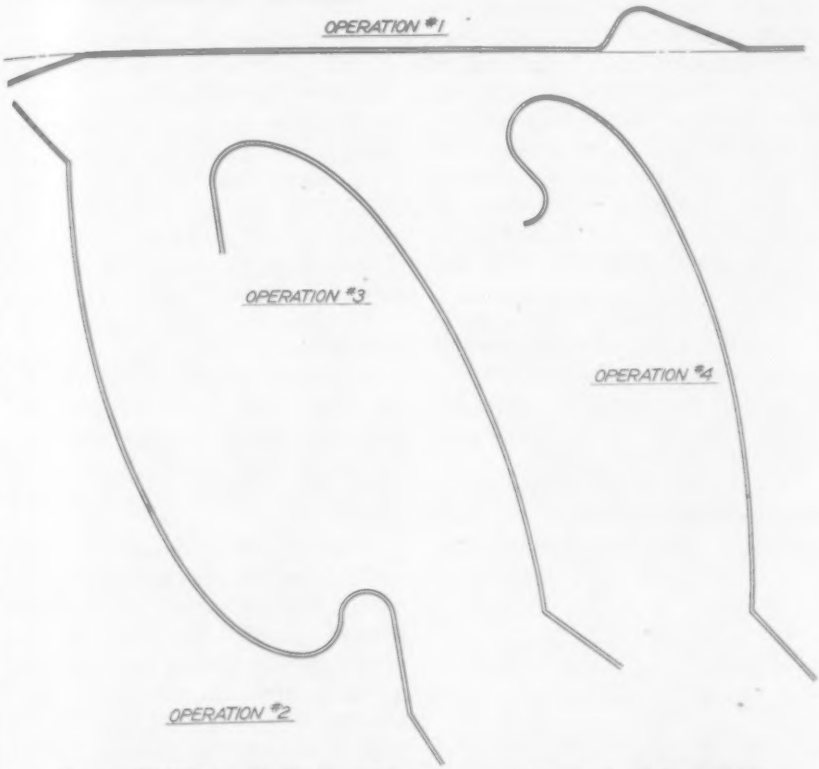
to the bead, or no bead at all, will be required in certain portions of the blank holder.

Experimental runs, with such a prominent bead provided, will naturally result in tearing the material where resistance to flow is too great. Gradual easement of the bead, or possibly complete removal of a segment with relation to the excessive stretching of the material, corrects the condition, relieves resistance to flow where the elongation limit is exceeded.

The advantage is one of working down to practical elongation, rather than the more expensive and more difficult course of working up to it by adding to a bead, or putting one in where none existed. The extent and position of tears readily indicate excessive elongation, point to where greater flow is required.

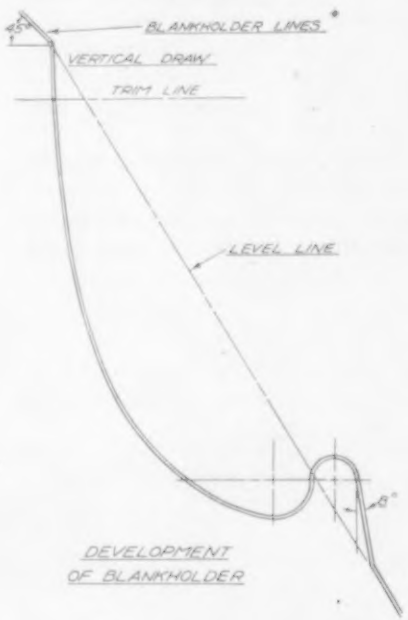
There are probably three distinct benefits to this approach. First, this method encourages exploiting the advantages of elongation or "stretch" wherever possible, and thus combats directly the formation of wrinkles.

Second, it permits making fullest use of beads, and does not depend upon the designer's decision to add another tenth of an inch, a decision he might hesitate to make though it might tend to eliminate some handwork in correcting springback.

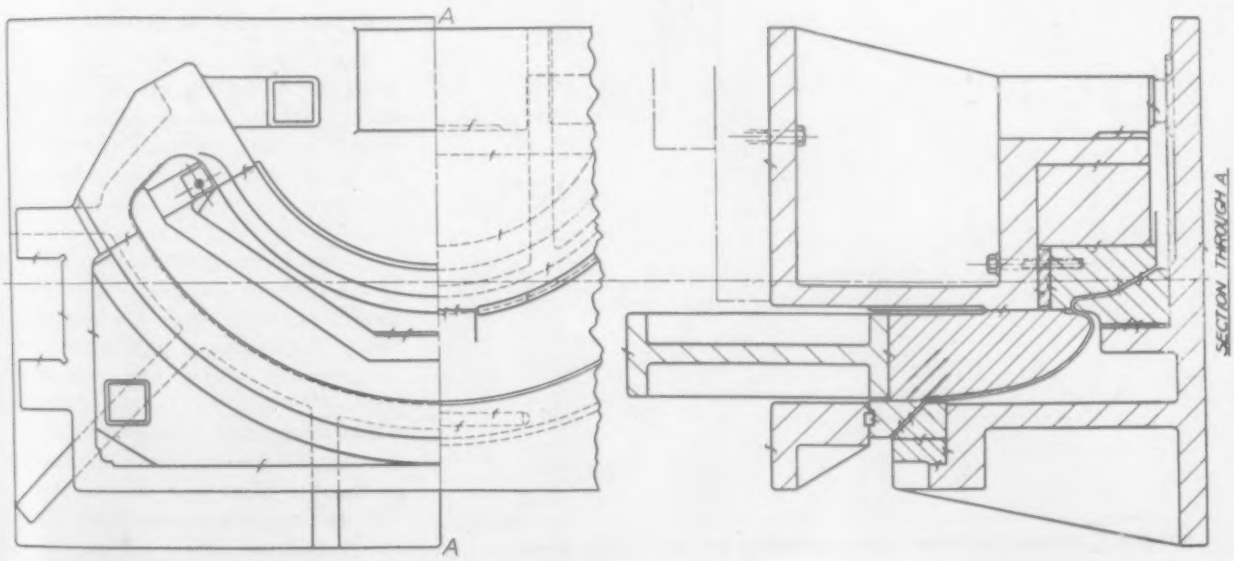


Above: **FIGURE 1a. Position of blank in press for each of four operations, required to draw nose cowling, is shown above. Centerline of blank is indicated. Blank actually curves 120°, as in Figure 1.**

FIGURE 2a.



Below: **FIGURE 2. Main section is formed in the second press operation.**



Third, every degree of flow control that can be designed and built into a die relieves the need for fine adjustment of the press itself. In fact, as dependence upon the blankholder is lessened, there is a possibility that wear and maintenance of the press will be decreased. Now all these factors can be recognized and cared for by adding heads, but it does seem that they may be cared for more adequately if all that is required is the simple operation of grinding off the excess rather than the more difficult task of adding to the inadequate.

Most draw dies in use at the Heintz plant are made from Meehanite "A", in that it presents a smooth, close-grained surface across which metal can stretch without tearing against open spots. Blank-holders made of this material are polished to a mirror-finish.

Mindful of the fact that elongation and drawing qualities of steel are greater than those of the 24S aluminum alloys, Heintz still uses much the same principles in drawing aluminum as in drawing steel. Where the elongation limit of steel was met less frequently, perhaps, it had been met before, and had been taken into account. In the same way, it is taken into account in drawing aluminum.

One of the most interesting jobs Heintz is doing today is that of stamping aircraft cowlings. It serves as an excellent illustration of wise investment of design time and labor in the original building of dies to save man-hours in the finishing department. An additional point in favor of the better die work is the elimination of training unskilled help for hand finishing operations.

Precision stamping of these parts has permitted the prime contractor, Crown Can Company of Philadelphia, to institute an up-to-date mass assembly operation spot-welding and riveting the parts together.

The forming of the cowling posed several difficult problems, the final solution of any of them generally depending upon success in working out the others. When Heintz undertook this job, cowlings were being produced by spinning and on the drop hammer, by other companies. The complete cowling, fitting over a radial engine, consists of a 360° formation, generally a truncated cone, with the metal around the smaller diameter turned under to form a radium—or reverse curve in cross-section.

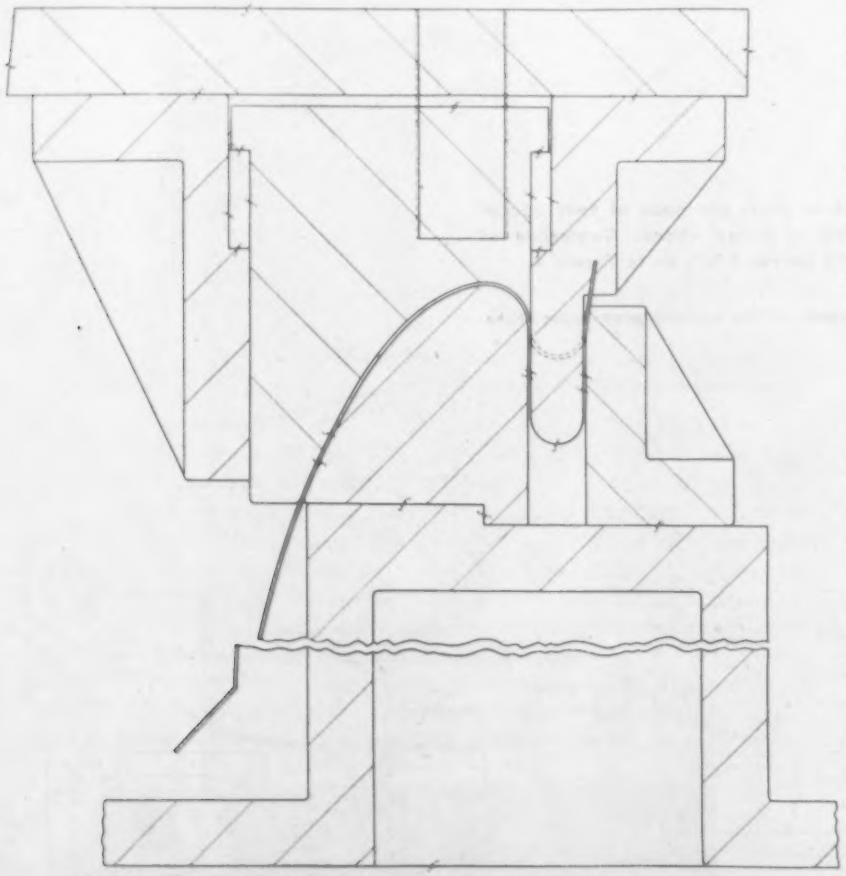


FIGURE 3. Flange die bends back secondary arc of reverse curve.

FORMING THE NOSE COWLING

The cowling has an overall length of 11-11/16″. From the large edge or diameter to within ½″ of the smallest diameter, the contour changes in fairly even steps from a radius of approximately 26.40″ down to a radius of 22.51″. The last half inch curves slightly more to a radius of 21.93″. The metal is turned at the bottom through 135° on 1″ radius (Figure1).

The changing contour as described, constitutes a cross-section of the part, with the noted radii referring to the third dimension (excepting the last mentioned 1″ radius) which refers to the cross-section. The cowling parts are formed in 120° segments.

Producing the compound curves—with reference to the changing radii—evenly throughout the 120° components, imposed problems in the construction of each of four dies required to stamp a completed part (Figure 1a). The last three draws perform the actual forming operation. However, the first draw is required to offset the excessive elongation which would have been required by beginning with Number 2 operation.

OFFSET EXCESSIVE ELONGATION

The first die forms the 120° segment, but more importantly it produces a bend of approximately 45° to form the blank holder at the end of the largest radii, and forms a reverse curve at the other end. This reduces the elongation requirement in the actual forming process from about 28 per cent to 13 per cent. More careful consideration of elongation limits, demanding a high allowance or margin of safety, was necessary because Heintz had to use double-action mechanical presses in place of the more conventional hydraulic presses for this type of operation. Though the presses were slowed, their action does not permit the easy flow

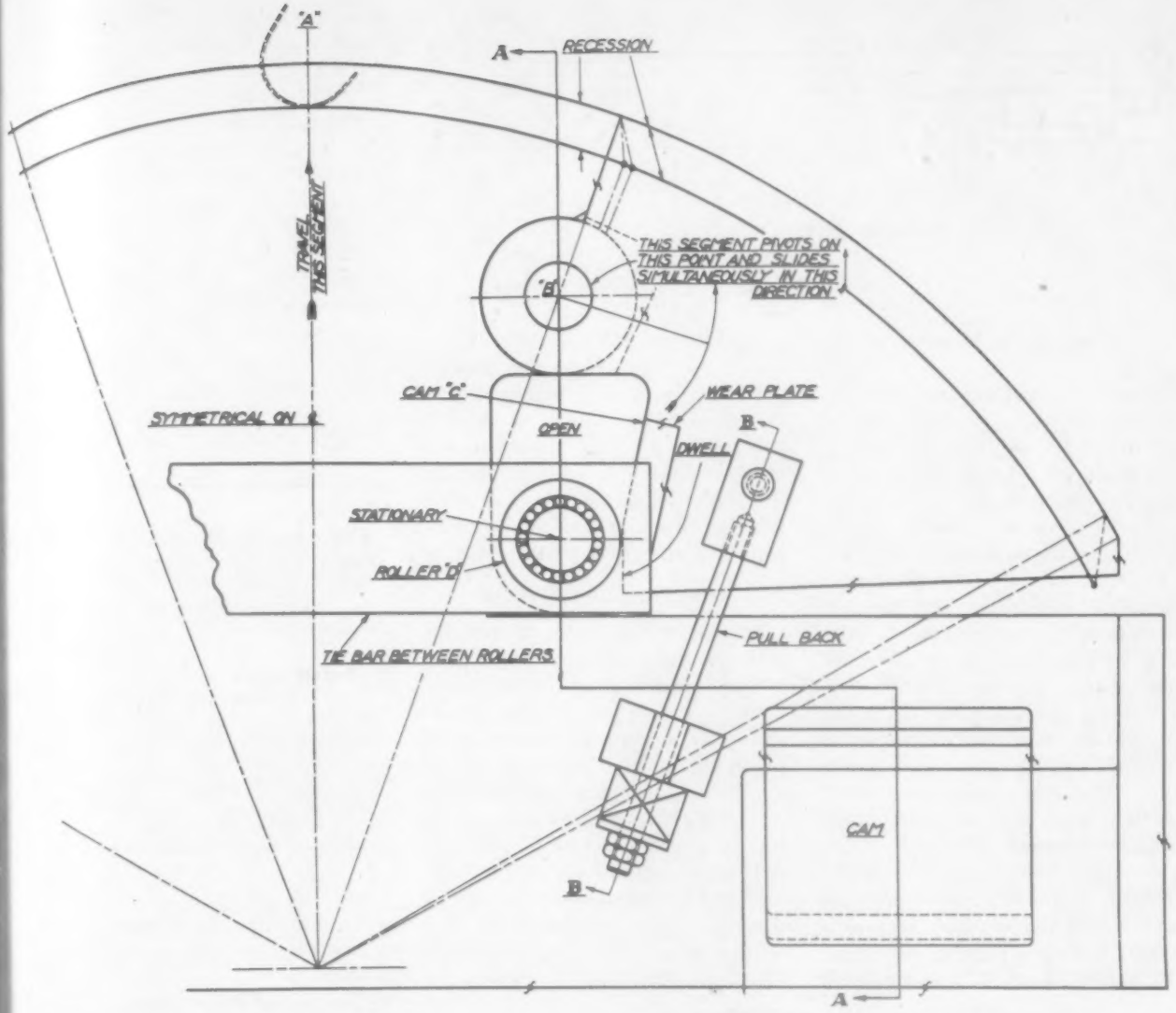


FIGURE 4. Cam die completes 135° of 1" radius in nose cowling. Die is actuated to prevent metal from squeezing from ends of blank, which curves through 120°, toward middle. Schematic drawing shows action of segmented punch.

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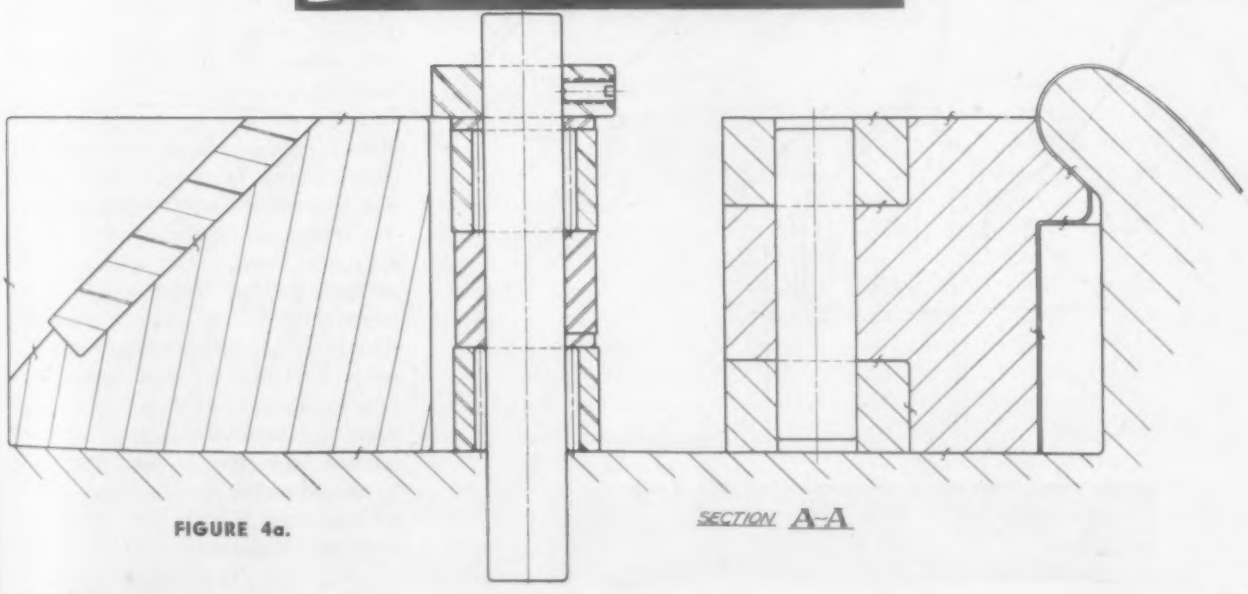

SECTION A-A

FIGURE 4a.

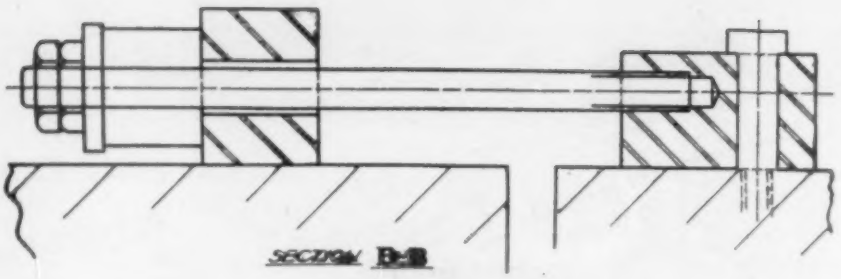

FIGURE 4b.

of metal attainable on the hydraulic press.

Number 2 die forms the main section of the part, complete through 90° of the 1″ radius at the bottom, and produces a bead in the blank holder. The difficulty in this operation arose from the production of the stamping at the pitch angle which was selected as necessary to proper flow of the metal (Figures 2 and 2a). As performed, the part is drawn to within 5/32″ of bottom, heat-treated, and then re-struck to full depth.

Number 3 die, a flange die, bends back the secondary arc of the reverse curve so that the extension, in cross-section, becomes a tangent to the 1″ radius at a point 90° from the origin of its development (Figure 3). With relation to the part's position in the press in the previous operation, the work is inverted so that it is suspended from that part of the curve (1″ radius). Used in a single-action press, the blank holder is equipped with car springs which compress with sufficient force, in coordination with the action of the punch, to maintain the position of the blank. It was found necessary to support the entire blank, incidentally, in that vibration of any free end setup strains tended to distort the part.

FUNCTION OF NO. 4 DIE

Number 4 die, a cam action die, performs the most interesting operation in completing the 135° of the 1″ radius (Figure 4). Actually the success of the last die could not be determined at the beginning of the operation. A review of preceding operation shows that as much allowance as possible was made to reduce the burden imposed on the final operation. The blank holder was formed in the first operation to as much bend as possible to reduce the excessive stretch or elongation throughout the forming of the main body. At the same time, the reverse curve was formed so that further forming of the 1″ radius would result in even distribution of the elongation around the curve. Simplifying the curve in the third operation set the stage for the final operation. It permitted entrance of the punch, yet left enough metal for the blank holder, so that stretch occurred where ordinary bending, with resulting spring back, might have taken place.

Recalling for the moment that the part is a 120° segment, it becomes apparent that the final forming of the curve around the 1″ radius must be performed with careful regard for the flow of the metal. It is necessary to prevent any tendency toward squeezing the metal from the ends of the arc toward the middle. Therefore, properly balanced application of pressure required that the punch be segmented, with the advance of the end sections delayed by a cam action in favor of the central portion. In addition, action from a radial point was necessary to maintaining an equal angle of thrust.

The cam die is segmented into three sections, each working approximately radial from a common point. The schematic diagram shows action. The center (or main) segment acts as a carrier for all, and moves along vertical line A. Right and left segments (right hand shown) rock on pins B, and, as segments advance into the work, are actuated by cams C, bearing against roller D. At final squeeze, side segments are static in relation to center or main segment by means of the dwell cam shown. A spring-actuated pull bar opens the segments on the return stroke.

THE END

● **Next month,** *Streamlined Production* will feature the broad range of manufacturing processes that are being employed in building two-piece hollow steel propellers.

Aeroproducts Division of General Motors is using ingenious profiling attachments on batteries of planers, big special purpose equipment, work indexing fixtures on turret lathes and internal grinders, and clever brazing fixtures. Look for this article in the October issue.

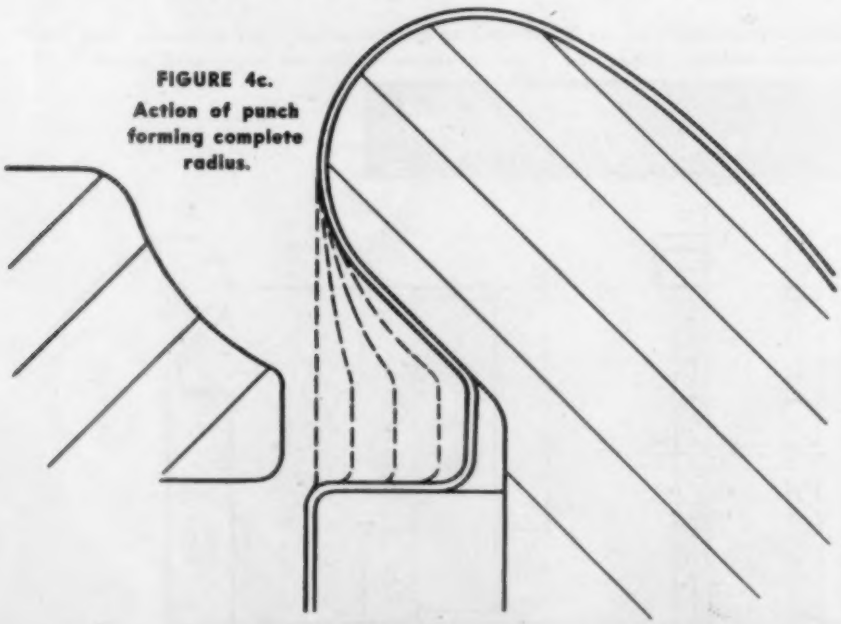

FIGURE 4c.
Action of punch forming complete radius.

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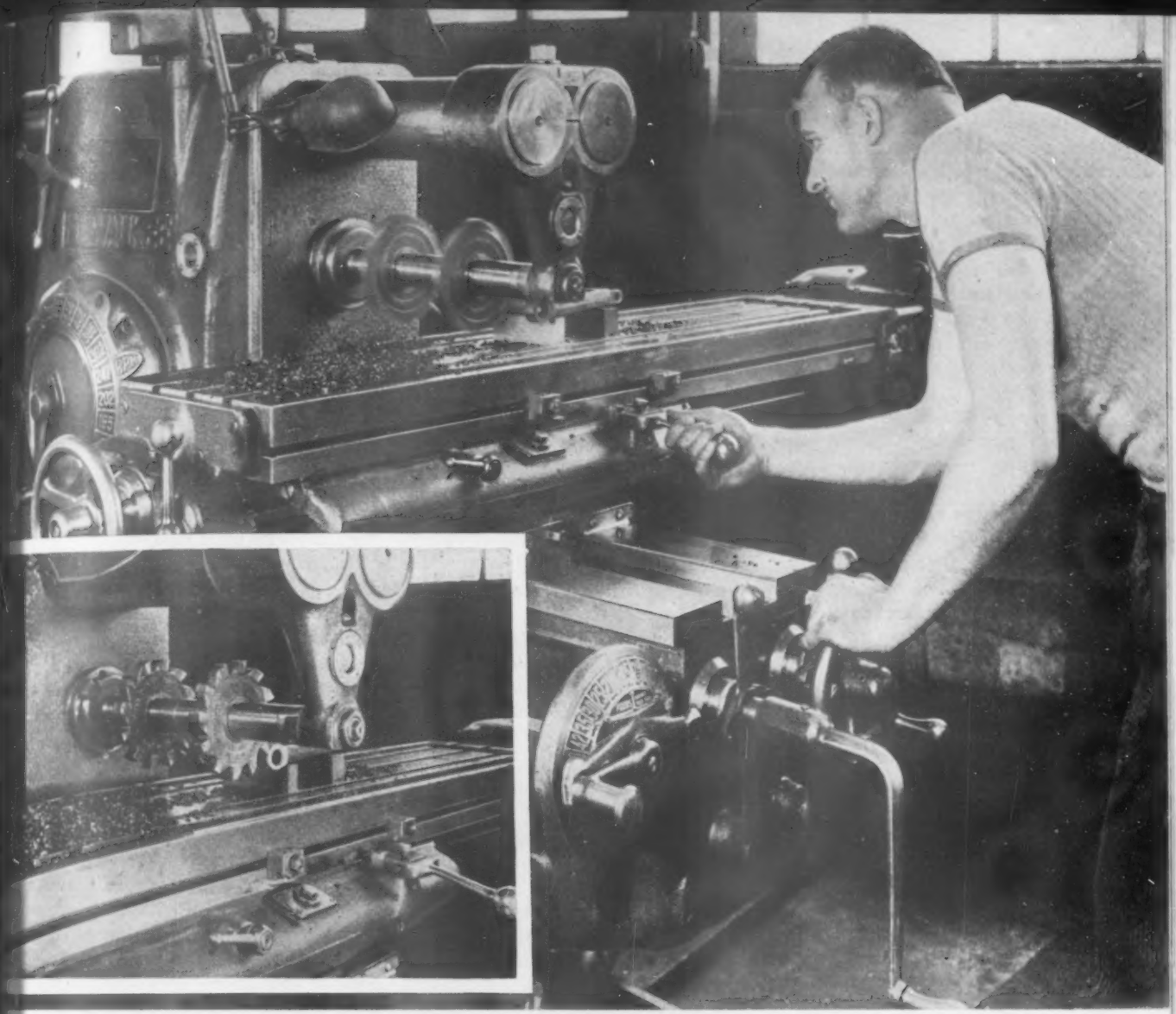


Results attained in milling steel with carbides on conventional equipment point to use on special equipment.

FUTURE OF CARBIDE MILLING ON SPECIAL MACHINES

MILTON J. STEFFES
ENGINEER
SUPER TOOL COMPANY

MILLING STEEL with carbides, enabling greatly increased production with a corresponding decrease in manufacturing costs, is a wartime development which can revolutionize metal-cutting in the automobile industry. Though carbide milling has long been used by auto builders in machining non-ferrous materials, cutter design was the same as that of high-speed steel cutters, with the result that the cost of tools tipped with carbide was four to six times greater. Carbides were considered only in milling applications when satisfactory performance could not be achieved with high-speed steel.

However, the advent of machinery with higher spindle speeds and high horsepower ratings has shown that carbide-tipped cutters can be used with as few as 20 per cent of the number of teeth used in high-speed steel cutters. This has greatly reduced costs of the carbide-tipped cutters, and has already broadened their field of practical use to proportions that would have been considered impossible a short time ago.

Results that can be attained in milling non-ferrous materials are limited in most cases only by the horsepower and rigidity of the machine and fixtures themselves. It is not uncommon to see machines operating today with table feeds of 3 to 9 feet per minute—not inches as was the case with high speed steel cutters.

Such performance causes one to wonder what carbide-tipped cutting tools can accomplish in the way of facilitating production on the highly specialized machines so common in the automotive industry. Everyone familiar with the automotive industry, realizes that competition in this field will be more keen than ever. The drive for lower manufacturing costs will certainly stimulate their application.

In the automotive industry, the

specialized machines are the rule, not the exception, and the majority of these machines in use today were designed around high speed cutters with comparatively low spindle speeds. To adapt these machines to carbide milling, it will be necessary to rebuild the spindles, and in many cases the gears, to stand the higher spindle speeds, and in the majority of cases, the horsepower will have to be stepped up to accommodate the greatly increased table feeds. Results which have been achieved in machining steel with carbides would seem to make such design conversion practicable.

These remarks on specialized milling equipment should not however, divert attention from the fact that throughout the automotive and other large industries there are many thousands of standard equipped milling machines now in use on which steel is being milled successfully with carbide-tipped cutters. This is being accomplished without changes in motors or gears, and indicates the fact that much can be done without waiting for extensive machine tool alterations, or the super-mill of tomorrow.

AMAZING PRODUCTION REPORTS

For years it was considered impractical to mill steel with carbide because of chipping, a fault caused by applying the same designs as on high speed steel cutters.

With the introduction of negative axial and radial rakes, the results achieved were spectacular, and hardly believable. Below are a few production reports from shops that are using carbide-tipped milling cutters in machining steel. Such figures indicate the value of carbide milling in a highly competitive market.

One manufacturer of Diesel motors is machining lugs off crankshafts for counterweights. This is a tough steel forging, which was formerly machined with high-speed steel cutters, operating at 90 rpm at a table feed of 1-⅛" per minute. Four crankshafts was the average per grind. The use of carbide on this operation has stepped up table feed to 12-½" per minute. The cutter life has been increased to 25 crankshafts per sharpening of the cutter.

TUNGSTEN CARBIDE ON 4140 STEEL

In another shop manufacturing motor mounts for aircraft use, the rest pads of these mounts are made of 4140 steel, heat treated to Rockwell 40 to 43 C. This operation formerly was done with high speed steel cutters operated at 50 surface feet per minute, with table feed of 7/8". Ninety pieces was the average between grinds. With the use of tungsten carbide this job was stepped up to 7-½" per minute table feed and 216 pieces was the average number machined between grinds. The horsepower requirements in both these cases was more than doubled.

Without doubt, many of the machines in the automotive industry will have to be rebuilt to use carbide-tipped cutters on their steel milling operations. But the cost of such rebuilding will be small compared with the time, labor and equipment savings that can be achieved.

The design of negative rake cutters has been much discussed in engineering circles. The number of teeth, and the amount of rake to be used are the most common questions.

The number of teeth to be used in a cutter depends entirely on the horsepower available to pull the cutter through the workpiece without stalling. Since carbide-tipped cutters are capable of removing metal at a greater rate than high-speed steel cutters, because of the higher cutting speeds, they require proportionally more horsepower. Approximately 1 hp is required to remove ¾ cubic inches of steel per minute. An accepted method of computing horsepower requirements applies the formula: hp=1.8D x F x N x R x W; wherein D=depth of cut in inches, F=feed per tooth, N=number of teeth in cutter, R=revolution of cutter, and W=maximum width of cut in inches.

Knowing the horsepower of equipment available and figuring tooth load at .003" to .005" depending on depth of cut, a determination can be made of the number of teeth it is possible to use in the cutter to obtain the maximum table feed.

In manufacturing cutters for general use, it has been found that because of the horsepower limitation on many machines, the number of teeth to be used was computed as double the diameter. But as stated before, this is entirely controlled by horsepower limitations.

NEGATIVE RAKE DETERMINATIONS

There is no set rule on the amount of negative axial and radial rake to be used. Experimentation shows that various types of steel require different angles for maximum results. Although the angles most commonly used on cutters made for general use are 7° negative axial and 7° negative radial rake, good results have been achieved with 10° negative axial and 5° negative radial rake, and 10° negative axial and 10° negative radial rake.

While carbide milling is an outstanding development of recent years, it is undoubtedly true that even greater developments in this field lie ahead. One needs only to look at the advancements to date to appreciate its importance in the competitive markets that are to come.

MECHANICAL OILER LUBRICATES PUNCH PRESS BLANKS

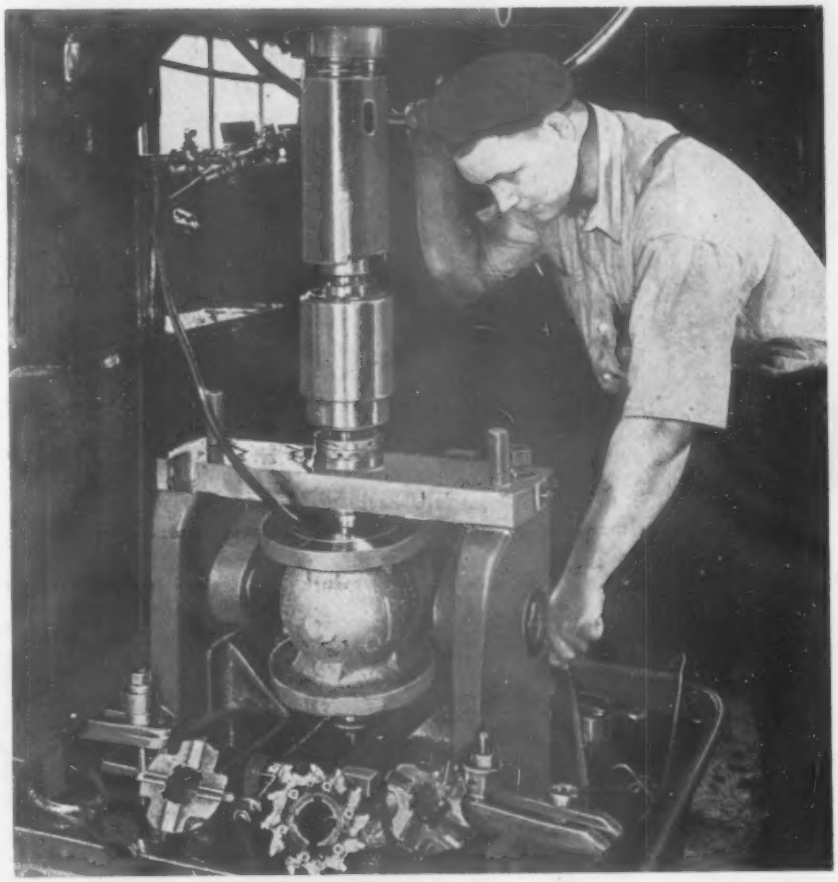
● A mechanical oiler developed to spread lubricant on punch press blanks has proved 10 times quicker than the former hand method. At Consolidated Vultee Aircraft Corporation's Vultee Field Division, it saves an estimated 1949 manhours annually and reduces oil consumption by 50 per cent.

The machine, a "wringer"-type roll, powered by a 1/16 hp motor, is mounted on casters for mobility and stationed by the press to be used. It is equipped with a pump, geared to the motor, which returns the oil from the sump tank to the supply tank. The punch press blanks are fed between two oil-coated rollers two inches in diameter, made of steel covered with Neoprene. Distance between the rolls is governed by the gauge of blanks and the amount of lubricant required to coat the material. These distances are determined by adjustable screws at each end of the roll.

An overhead tank drip-feeds the top roll while a second tank is equipped with a five-inch diameter hardwood "floating" cylinder to feed oil to the bottom roll. With the aid of this machine, operators have been enabled to oil the blanks at a rate of 4000 per hour.

Tooling the Drill Press for Multiple Machining Operations

Driver bar, actuated by drill press spindle, carries tools which adapt machine to perform four operations—a typical turret lathe job



Finishing valve seat ring recess in a cast steel valve body in special indexing fixture used on drill press. Friction clutch serves to drive tool holder bar.

THE IRON FIREMAN plant in Portland, Oregon, has built up a varied production experience in its wartime manufacture of hundreds of different aircraft, torpedo, and ship parts. By and large, the tools once used in producing automatic coal stokers for heating plants were converted to the war jobs. One of the most interesting adaptations of the tools at hand to the work to be done was that of designing equipment for production of a large number of cast steel, wedge-gate valves, ranging from 2″ to 6″ in size.

Already crowded to capacity, the plant did not have sufficient turret lathes to devote to the job of producing all the valves scheduled. Under the direction of Eugene Butzer, chief tool designer, the tool engineering department devised fixtures and cutting tools so that the work could be done on available drill presses. As finally set up, the 2″ to 4″ valves are finished on drill presses to a tolerance of .0005″, which eliminated the need for filing or lapping. The 5″ and 6″ valves are machined on a Warner & Swasey No. 5 turret lathe.

INDEXING FIXTURE ON DRILL

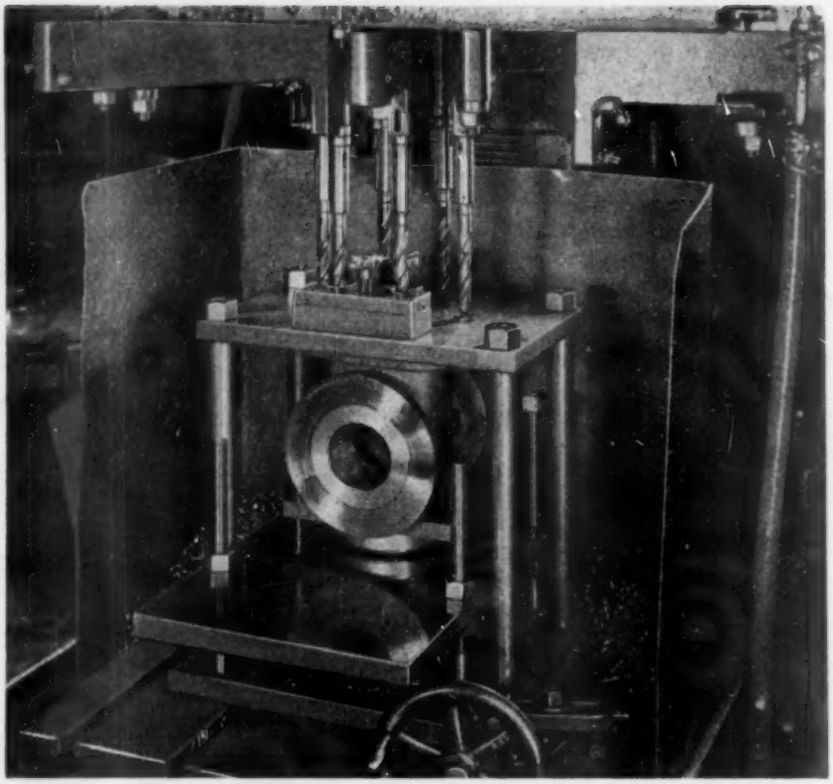
The first operation consists of facing the flanges. This is done on a milling machine using 10″ carbide-tipped cutters at 200 rpm, with a cutting speed of 5-½″ per minute. After the flanges are faced, the smaller valves are placed in a special reversible indexing fixture on the drill press and are carefully centered from previously drilled holes in the bonnet

Tools and driver bar for machining valve seats in indexing fixture used on drill press. Driver bar shown is fitted with roller bearings on top and bottom.

Cutting tools are, *from right to left:* Roughing tool for cutting seat recess, finishing tool for sidewall and bottom, tool for chamfering and counterboring recess, and waver tap.

Tongs are used for inserting tools through bonnet opening in the valve shown at top.

Iron Fireman photos



Drilling bonnet flange on 3" valve body. Elevating table fixture is used.

flange. A tool driven bar, which is provided with top and bottom roller bearings and driven by a friction clutch, is then inserted. Cutting tools are mounted on the driver bar through the bonnet opening by means of special tongs. A roughing cut is taken and the tool is then changed for one that makes a finishing cut on the sides and the bottom of the recess in which the valve seat rings are to be screwed. The third tool to be placed on the bar is one that chamfers and counterbores the recess. All of these tools are carbide-tipped and have collars for adjusting the height to assure precision setup in the fixture. The recesses are threaded by means of a waver tap, which has a steel body with high-speed tool steel tips brazed on. Threads are circle ground on this tap, in a Jones & Lamson thread grinder. A No. 3 precision thread is cut.

After one recess has been threaded the driver bar is withdrawn and the fixture is rotated to rest on the indexing pads on the other side, and the operation is repeated for the second

Machining face of wedge in reversible indexing fixture. Both faces are finished and hole for valve stem is bored and tapped.

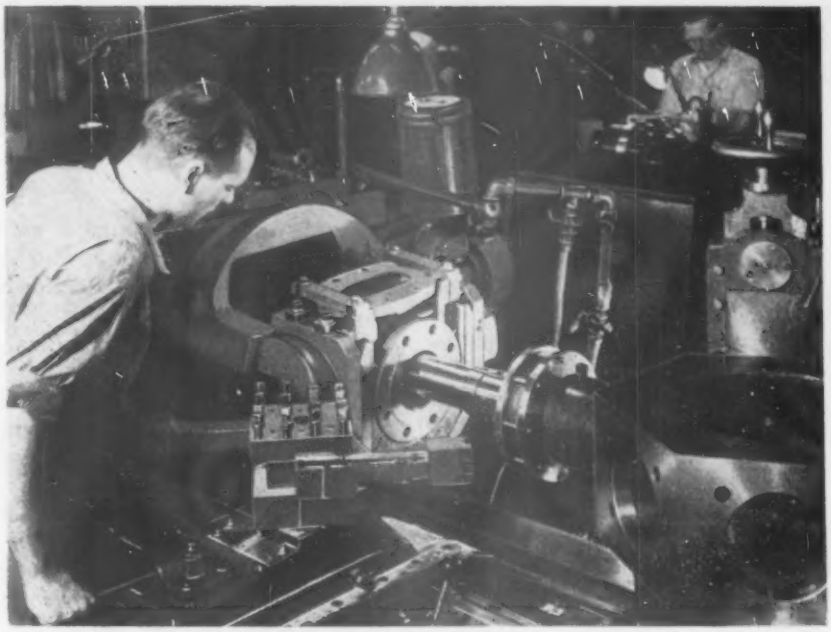
valve seat ring recess. Because the fixture allows the valve body to be so mounted that it is in absolute alignment and since the driver bar is set to close tolerance by means of the stop collar and the fixed collar on top of the fixture, precision machining is accomplished on a drill press. The drill press is used only as a source of power for the cutting tools.

Five and six inch valves are machined using single tools and waver taps with the valve bodies mounted in an indexing shuttle fixture. Care is used in machining the larger valves to avoid filing and lapping.

MACHINING WEDGE GATE

The wedge-gate, which must be finished to fit accurately against the valve seat rings, is machined in a reversible indexing fixture. The opposite faces must be in perfect horizontal, parallel alignment and are finished at an angle of 5 degrees from the vertical. The guide slots on the sides are first milled, and taper wedges placed in these. When inserting the wedge in the reversible fixture, these taper wedges take up any difference in width from the milling operation. After setting up, the wedge is finished on one face, indexed 190° and finished on the other face. The valve stem hole is bored and tapped while in this fixture. Absolute alignment of each face of the wedge to the center line is maintained by this setup, and the face machined to a tolerance of .0005″ so that it will fit the seat rings without further filing or lapping.

The use of these special fixtures, particularly the ones adapted to the drill presses has enabled Iron Fireman to produce these valves at a rate much faster than first estimated. As originally set up, it was figured that it would take two men forty-five minutes for each valve seat recess. After the special fixtures were installed and perfected one man could finish both seat ring recesses in about twenty minutes.



Machining and threading ring seats in 6″ valve body on Warner & Swasey turret lathe, using index shuttle fixture.

Electronic Drive Control Helps Cut Machining Time From 13½ Hours to 5 Minutes

FINISHING TIME in machining aluminum spar beams for plane wings has been reduced from 13-½ hours to five minutes at a Cleveland aircraft plant with the help of General Electric Thy-mo-trol, an electronic control. The unit is installed on a large automatic contour milling machine designed and built by the Onsrud Machine Works, Inc.

Spar beams are long, one-piece structural channels which run lengthwise through the wing, from fuselage to wing tip. The spar must be machined accurately to permit perfect joining of ribs and cap strips, and contoured exactly to conform with the wing shape.

The carriage of the machine houses four cutter motor assemblies, providing two horizontal and two vertical cutters which turn at 3600 and 10,800 rpm, ideal speeds for the aluminum alloys involved. Each cutter is controlled by a follower which travels over a template as the carriage moves along the table. With the four cutters, every type cut required by spar beam design may be made, such as face, slot, and side milling, twist cutting, beveling, and making cutouts.

MEETS VARYING CONDITIONS

Need for flexible carriage speed control was met by the electronic drive control, which assures that the cutters are fed to the work in relation to the changing contours of a spar beam. In one pass over the table, depth of cut may increase and decrease several times. Number of cutters entering the work may change from one to four. Such varying conditions required a change of feed to avoid overloading the cutter motors. Moreover, a fast "skip" speed was essential to save time when not cutting.

The electronic drive system used on this setup converts a-c power to d-c to obtain a stepless speed range with a rheostat-controlled d-c carriage-drive motor. The control permits a carriage feed at any speed from 4″ to 18′ 6″ per minute.

Automatic cam bar feed designed by Onsrud engineers makes it unnecessary for the operator to judge maximum speeds at which the carriage can be fed during the many different conditions encountered in a pass. A rheostat-connected follower travels over the cam bar, which is contoured in relation to the work. Up-and-down travel of the follower varies the control of the rheostat, and at every point of the pass, the mechanically pre-determined carriage speed is at the exact maximum that work will permit. THE END

Sub-Zero Cooling Benefits Discussed by Experts

HARDENING of tool steels depends primarily upon the carbon dissolved in the steel. Whether or not subcooling is employed, it is first necessary to heat the steel into the high-temperature form, known as austenite. Austenite dissolves considerable carbon, the exact amount depending on the heating temperature and the alloy content.

If austenite is cooled faster than a certain critical rate, which also depends on the alloy content, the dissolved carbon can be held in solution in the low-temperature form of iron at room temperature. This solution, supersaturated with carbon, is known as martensite, and is extremely hard and brittle.

During quenching, steel retains its austenitic form until a temperature well below the normal critical point is reached: 400° F or lower. This temperature, at which martensite begins to form on cooling, is known as the Martensite Point, or M-point. Since transformation continues until cooling stops, the longer cooling is maintained, the more martensite is produced. In most tool steels, most of the austenite has gone over to martensite at room temperature.

At room temperature the following factors contribute to the state of the tool, and form a basis for consideration of further treatment: (1) martensite, which usually accounts for at least 80 per cent of the structure, (2) retained austenite, the remainder of the soft, high-temperature form which has not as yet decomposed, (3) carbides undissolved at the austenitizing temperature, and (4) internal stresses set up by quenching and the austenite-martensite reaction.

If cooling is continued through room temperature to sub-zero temperatures, transformation continues until some limiting low temperature is reached. However, the austenite-martensite reaction rarely achieves 100 per cent completion on reaching the limiting temperature. If cooling is interrupted, either at room temperature, or by tempering prior to subcooling, the reaction is partially or completely suppressed.

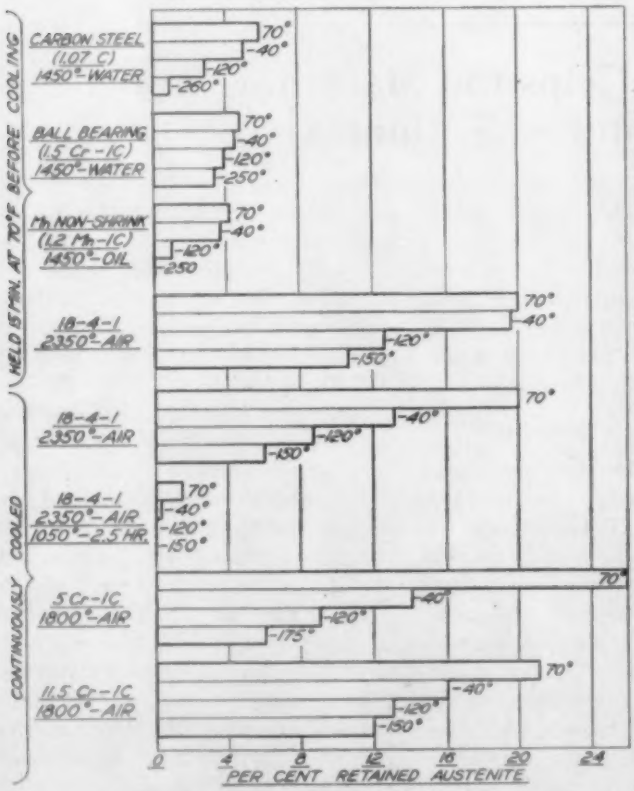
It is not possible to express all the practical results of subcooling on the basis of what is known about the internal structure of the tool prior to refrigeration. However, as knowledge of the factors affecting the structural changes at low tempeatures accumulate, the problem will become clearer.

●

RESULTS OF GAGE STEEL STUDY

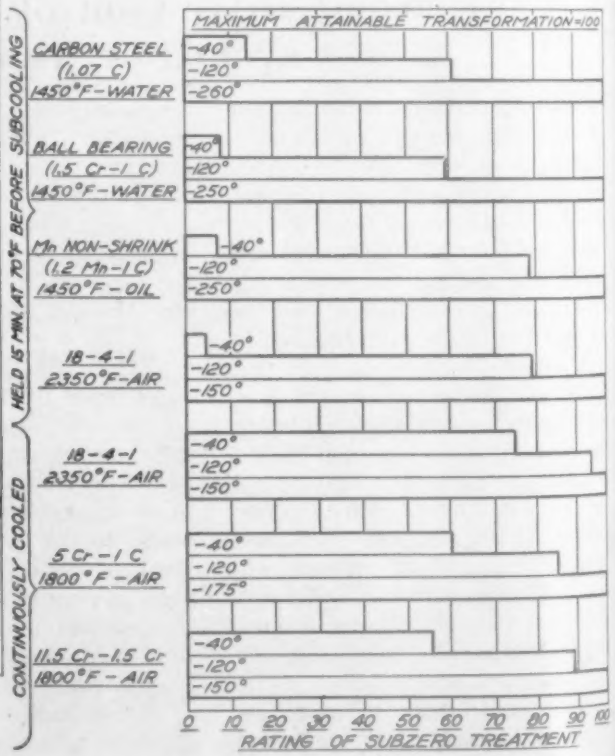
DR. S. G. FLETCHER
MASSACHUSETTS INSTITUTE OF TECHNOLOGY

AT Massachusetts Institute of Technology, a project has been set up to investigate the dimensional stability of metals, particularly gage steels. This research is sponsored by the Sheffield Foundation of Dayton, Ohio. It is known that subcooling of



Above. TABLE A. Retained Austenite After Cooling.

TABLE B. Relative Effectiveness of Sub-Zero Treatments in Transforming Austenite.



gage steels promotes stability, but the best treatment or sequence of treatments to use have been a matter of controvery. A thorough study of the behavior of gage steels subjected to sub-zero cooling after hardening has been focussed on the decomposition of retained austenite as the most likely controlling factor in attaining dimensional stability. Since gage steels are the same or similar to many tool steels the results can apply to subcooling tool steels.

Because the specific effect of retained austenite on cutting tool performance is not well understood, it is not easy to predict what advantages can be obtained by decomposing retained austenite by subcooling. However, this transformation is the only tangible change that has yet been detected, so there may be some relation between it and the reported benefits of the cold treatment.

Growth of Metal

Dimensional stability may be analyzed more precisely because instability usually results in expansion or growth. This is undoubtedly caused by the extremely slow breakdown of austenite at room temperature. For every 100 volume units of austenite decomposing, 104 to 105 units of the decomposition product are formed. Such growth may result from aging for weeks, months or years at room temperature if austenite is retained.

The easiest way to decompose retained austenite is by tempering. In plain carbon and low alloy steels 450° to 500° F is usually adequate, but in high alloy tool and gage steels tempering two or three times to 950° F or higher may be necessary. Unfortunately such temperatures result in some softening of the hard martensite.

Measuring Austenite

Sub-zero cooling may be used to decompose the retained austenite without loss in hardness or wear resistance. In fact, some increase in hardness may be encountered. The relation of subcooling to cutting properties of tools and tool and die life is somewhat uncertain, but if this transformation is not entirely accountable for practical improvements, it at least seems partly responsible.

The X-ray techniques developed at M. I. T. permit measuring the retained austenite, present in a piece of steel, to a precision of about 0.25 per cent of the total structure, down to around two per cent austenite. In studying sub-zero decomposition of austenite the procedure used is first to quench several pieces of the steel and determine the amount of austenite retained. Then pieces of the same steel are quenched in the same way, transferred to a sensitive dilatometer, and the length changes noted in cooling to around -300° F. It is known that when austenite transforms to martensite on subcooling, a volume increase of 4.6 per cent results. It is possible then to calculate accurately the transformation.

Results of such experiments and calculations for a number of different steels are shown graphically in Tables A, B, and C for arbitrarily chosen temperatures and the low temperature limit of transformation in each case.

Table A shows the amount of austenite retained after quenching and after sub-zero cooling treatments for several steels. In the first four cases the specimens were held 15 minutes at room temperature before subcooling, and in the latter four cases cooling was continuous from the quench. The cooling rate below 70° was maintained at 5° per minute.

Effectiveness of Subcooling

To compare the effectiveness of each of the subcooling temperatures Table B was constructed, assuming that the maximum attainable transformation has a rating of 100.

Highlights of this data are:

- 1. Plain carbon and low alloy tool steels retained considerably less austenite than higher alloys.
- 2. It is necessary to cool to low temperatures for maximum effect on plain carbon and low alloy tool steels, such as -250° rather than -150° F as for high speed and high carbon-high chromium varieties.
- 3. In 18-4-1 high speed steel, less than two per cent austenite is retained in a properly hardened and single tempered tool. Overheating, interrupting the quench, or undertempering raise this value substantially.
- 4. Cooling to -120° F results in better than 75 per cent maximum attainable transformation in all except plain carbon, and ball bearing types.

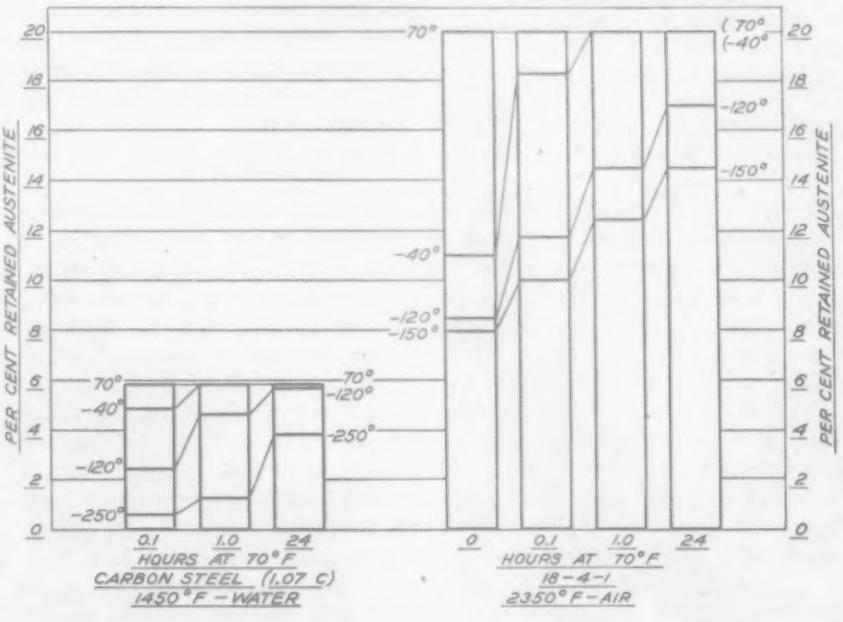
● A forum on "Sub-Zero Transformation of Hardened Steels" was conducted by the following speakers:

Dr. S. G. Fletcher, Massachusetts Institute of Technology; Mr. G. B. Berlien, Lindberg Steel-Treating Company; Mr. R. P. Kells, Latrobe Electric Steel Company; Mr. S. M. DePoy, Delco Products Division, General Motors.

Each man spoke on a phase of the subject. Questions from the audience were answered by the best authority on the point involved. The meeting was conducted by the Detroit Chapter of the American Society of Tool Engineers.

M. I. T. Tables

TABLE C. Effect of aging tool steels at room temperature prior to sub-cooling.



There it gave about 60 per cent effectiveness.

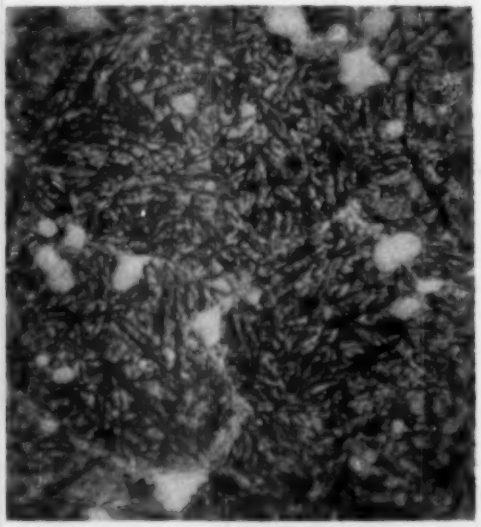
●5. Even after complete subcooling much retained austenite is left in high alloy steels. Cooling is strangely inefficient with respect to ball bearing steels, as well, little of the retained austenite being transformed.

Aging at Room Temperature

Table C shows the effect of aging at room temperature prior to subcooling. In the plain carbon steel one hour at room temperature is enough to render -40° F completely ineffective, while 24 hours does the same for -120° F. The effect is not quite so great in 18-4-1 high speed.

Limited experiments with plain carbon steel have indicated that tempering prior to subcooling inhibits transformation in the same way as extended room-temperature aging. One hour at 300° F has been found to prevent completely any sub-zero transformation down to -300° F, while one hour at 212° allows only about 5 per cent of the normal transformation.

FIGURE 1.



Molybdenum-tungsten high speed steel tempered twice at 1050°

Delco Products microphotos

The factor of internal stresses has not been mentioned here, because there is no known method of measuring these stresses.

Until it has been shown conclusively that all benefits cannot be explained on the basis of retained austenite, expediency dictates avoiding the difficult problems of stress analysis.

INCREASING TOOL LIFE

G. B. BERLIEN
LINDBERG STEEL TREATING COMPANY

IN super-cooling both the straight tungsten and molybdenum varieties of high-speed steel, excellent results have been recorded. Other alloys are benefited also. Steels which tend on quenching to leave something wanting—that is, do not quench out to the potential maximum hardness—are usually improved by super-cooling.

Subjecting high-speed steel to low temperatures may increase hardness, which after conventional quenching and tempering, is a little lower than desired. Reason for the low reading is usually overheating or oversoaking slightly. Though improvement is customary following hardening to correct temperatures, the reaction seems to be greater when heat treat temperatures extend to the high side.

Sequence for Super-Cooling

Users disagree as to where super-cooling should be applied in the treatment. Experience indicates, however, that when cooling fine-edged or delicate tools which cannot stand high hardening temperatures, the best response is obtained by cooling directly after quenching. Then the tool is tempered and cooled again in that a completely quenched and drawn structure does not result from one cooling.

When tools have been hardened from the high side of the range—for example, an 18-4-1 steel hardened from 2375° — favorable results are obtained from cooling after the draw to 100° below zero or lower. Cutting efficiency improves with progressively lower temperatures. However, improvement does not begin to increase rapidly until about 90° below zero has been reached.

Treatment of Stock Tools

Why super-cool? A cutting tool is treated to sub-zero transformation to increase the number of pieces obtainable per grind, or to improve cutting efficiency. Variables can be introduced which will defeat super-cooling. A tool of delicate design hardened from the low side of the hardening range—about 2100° for molybdenum high-speed varieties, or 2225° for 18-4-1 will be slow to improve, and it will be necessary to freeze after the quench and after the first draw.

In sub-zero treatment of stock tools, uncontrollable variables tend to defeat consistent improvement. If prior thermal history is unknown it is difficult to predict the result. However, the tool will not be harmed, and it may be improved. On this basis, it is frequently considered a good investment to super-cool and temper stock tools because treatment may raise hardness from 63 or 64 to 65 or 66 Rockwell "C". Usually the cutting edge stands up better if that high hardness is tempered back to the hardness obtained conventionally.

Increasing Hardness

Steels that are usually alloyed with nickel and carburized, such as the SAE "2000 series", the carburized tungsten shock steels, and high-carbon high-chrome, respond favorably to sub-zero treatment. Most heat treaters are familiar with the experience of quenching an SAE "2000 series" steel after carburizing, and finding the hardness ranging only from 58 to a possible 61, when 63 or 64 is desired. If quenching is sufficiently rapid that certain portions of the case are not permitted to revert to the annealed structure, it is possible to super-cool and temper the part and bring it up to a favorably high hardness.

Carburized shock steels react much the same as the nickel alloys. Where heat-treatment is applied to raise the surface carbon content, and hardness is below expectations, super-cooling followed by tempering, brings the tool up to maximum hardness values of approximately 64 Rockwell "C".

Thermal Shock

High-carbon high-chrome is a complex steel which responds interestingly to super-cooling. With hardening at only 50° higher than recommended, surprisingly low Rockwell readings may be obtained, though the material seems file hard. Though successive tempering operations might raise hardness values over 60, one or two super-cooling treatments may develop desired hardness. Treatment at 100° below zero, followed by tempering should be sufficient.

It is natural to expect super-cooled quenched steel to crack, and thermal shock, applied to selected portions of a tool, will crack it. But, with sufficient protection during the super-cooling cycle, little cracking occurs. Intricate shapes, such as dove-tailed form tools, should be wrapped in pa-

per to slow cooling rate. This has no effect on results, in that the rate of cooling does not seem to be important.

Experience with super-cooling has indicated that breakage can be held to one per cent, which is not much higher than conventional hardening produces. Heat treaters find that super-cooling aids in meeting hardness specifications, and gives ultimate consumers a product having maximum physical properties inherent in the material.

SUPER-COOLING VS. TEMPERING

R. P. KELLS
LATROBE ELECTRIC STEEL COMPANY

THE OBJECT of sub-zero treatment of high speed steel tools is to break austenite and produce martensite for good cutting tool performance. Another means of breaking down quenched structures however, is by drawing or tempering. Experimental work leaves a question as to whether, after proper austenizing, multiple tempering does not produce the same results as freezing and tempering.

Records of individual jobs with super-cooled tools show variable results. Sub-zero treatment of cobalt high speed turning tools employed on a turning operation which involved intermittent cuts resulted in an enthusiastic testimonial. Another shop performing the same type of job might report no increase in tool life.

One attribute, however, seems to be present in every case of freezing. The process produces stability through relieving of stress, resulting in more complete structural equilibrium. Tools treated by this method, are less liable to check or crack in grinding. It follows then that chipping will not so readily result when tools become heated in service.

Undoubtedly, there are many records of increases in production through super-cooling. Why benefits are not consistent is a question, that remains unanswered. However, though better tool performance cannot be consistently obtained in all cases, freezing seems in no way detrimental to cutting tool life.

MORE THAN TRANSFORMATION

S. M. DEPOY
DELCO PRODUCTS DIV., GENERAL MOTORS

THERE is a growing belief that full transformation of the solution structure of hardenable steels requires cooling to lower than room temperature. Almost all transformation has taken place in carbon and low alloy steels at 70°, but movement in carbon steel gages after good heat-treatment of only a few ten-thousandths proves that some tranformation continues. Super-cooling has proved an effective stabilizer. Higher alloy materials, with their sluggish hardening characteristics, are even more affected by sub-zero tempering because more solution structure is retained.

Placement of sub-zero cooling after the temper seems to make little difference, except in treating high-speed steels heated on the low side of the critical temperature. Drawing at temperatures as low as 1050° conditions the solution structure for transformation. But temperatures as low as 800° do not even produce conditioning, and necessary hardness cannot be obtained unless sub-zero cooling is applied.

A satisfactory practice has been to draw at 1050°, super-cool, and draw at 400°, which seems sufficient to temper the remaining structure. The resulting structure after cooling is untempered martensite. This must be tempered, and 400° F is sufficient.

Effect on Microstructure

Experience indicates that super-cooling produces more benefits than can be accounted for by the slight additional transformation. Photographs of micro-structure help to show what takes place in super-cooling tools. Figure 1 shows a "double-six" steel (molybdenum, tungsten high-speed) which was hardened at 2275°. It was not super-cooled, but was tempered twice at 1050°. Austenite appears definitely in the background. Long needles of typical acicular structure of martensite show in the usual form.

Figure 2 shows the same material, hardened the same way, but super-cooled between tempers. The grey background shows less acicular structure. Carbides at the grain boundaries resulted from hardening at a high temperature with a long soak.

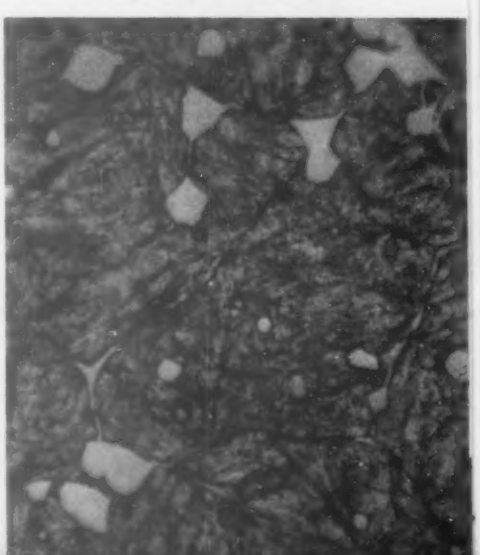
Figure 3 shows a tungsten, molybdenum, cobalt steel hardened at 2275° with a long soak. Again the heavy acicular structure of the martensite appears. When this material was super-cooled, following the same hardening experience, acicular structure disappeared and the more even grey background appeared, as in Figure 4. Figure 5 shows micro-structure of the same material hardened at 2225° and super-cooled at -85°, the presence of austenite, and no grey background, leaving much to be desired.

FIGURE 2. Molybdenum-tungsten steel super-cooled between tempers.

Air-Hardening Steel

Considerable experience with air-hardening steel has high-lighted certain benefits of sub-zero treatment. This alloy—one per cent carbon, five per cent chrome, one per cent molybdenum—has high hardenability, but it has possibly the strongest tendency of all hardenable materials to stay in the austenitic condition. It was once necessary to temper all large sections of this alloy at 975°. Super-cooling has eliminated this trouble, and has permitted establishing an expansion value of about .001″ growth per inch in boring large dies, compensation for growth is established by machining .001″ under per inch of specified di-

FIGURE 3. Tungsten-molybdenum-cobalt steel hardened at 2275°; long soak.



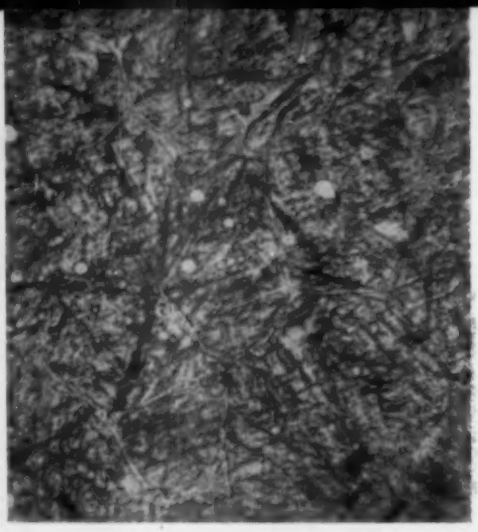


FIGURE 4. Acicular structure disappears after super-cooling (see Fig. 3).

ameter. By heating to 1750°, drawing at 400°, cooling at -120° for approximately seven hours for large dies, re-tempering at 400°, and grinding in accordance with the expansion value, dies can be produced to specification.

Expansion Through Super-Cooling

One experience interjects a note of doubt as to whether transformation is all that takes place in super-cooling. A punch was turned to dimensions that were too low to clean up by grinding. The punch was approximately 17″ in diameter. After hardening, drawing, super-cooling and drawing again, the punch was still undersize. Still another super-cooling followed by a 400° temper failed to produce any change.

A decision was made to draw the punch to the secondary hardness range—975°. The punch lost .005″ more in diameter. Super-cooled for an overnight period, the punch showed a growth by morning of .016″.

FIGURE 5. Cooled only to -85°, steel leaves much to be desired (see Fig. 3).

This last operation made the punch .008″ oversize and it could be ground to size. However, there is no indication that such success is to be expected. Knowing though, that even under possibly peculiar circumstances that shrinkage can be caused by drawing and expansion by cooling is an interesting sidelight.

Results from super-cooling will vary in accordance with prior treatment. If a material has been definitely injured by heating and quenching, little help can be expected from super-cooling. Some times re-heat and quench establish certain physical stages which make the material responsive to super-cooling.

The phenomena of super-cooling can be checked easily and inexpensively, with an ordinary industrial refrigerator, operating at -40°. Dry ice will produce temperatures as low as -108° to -110°, if the container is placed in the refrigerator which acts as an insulator. THE END

Questions and Answers on SUPER-COOLING TOOLS

Does super-cooling decrease burning and checking of tools in grinding?

●An experiment was made with blades for a threading cutter where conventional attempts to eliminate cracks in a hard material had failed. The blades were super-cooled overnight, ground, and put to work. All grinding cracks were gone, though no particular precautions were taken to prevent their forming. On another occasion, samples of "double-six" high-speed steel were super-cooled and it was found that they could be ground with a hard wheel, without surface checking. Martensitic structure withstands wear better than austenite.

Is the success of super-cooling measured solely by Rockwell hardness?

●No. Sometimes, hardness between super-cooled and conventionally treated tools will not vary a half-point. The draw following super-cooling frequently brings hardness down to the same as before cooling. Tools, however, show increased life. Increased cutting ability cannot be predicted from Rockwell and impact values, with relation to super-cooling. Impact values may be lower following super-cooling, yet chipping will not occur on the cutting edge. Impact values do not relate to operating conditions.

Do super-cooling qualities show up through a nitride case on high-speed tools?

Super-cooling produces internal changes, which would not seem to be affected by, or to affect, nitriding or chrome flash plating. The principles involved have nothing in common.

How do super-cooled tools compare with carbide?

●The relationship is not affected. Super-cooling may only improve the cutting qualities of high-speed tools for the jobs to which they are best-suited in the first place.

Has shot blasting been tried in relation to super-cooling?

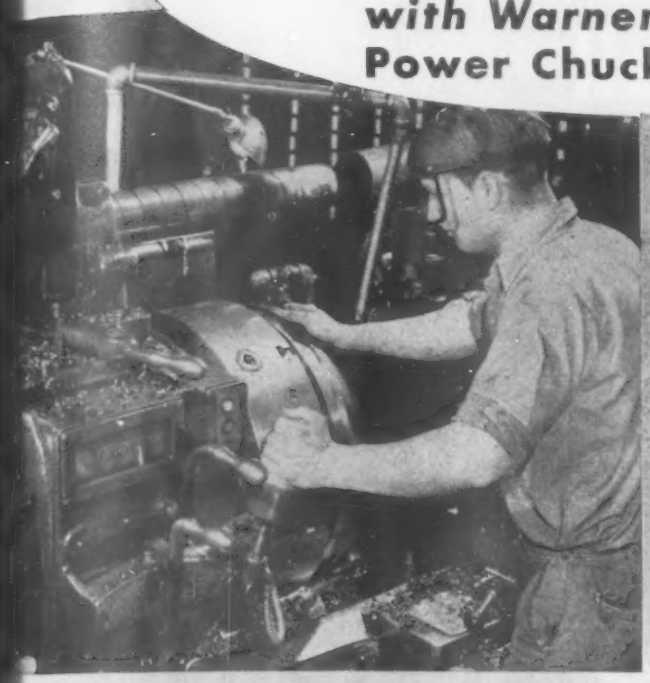
●Shot blasting is a surface conditioning operation. Because it does not penetrate, and thus does not affect inner structure, it would neither affect nor be affected by super-cooling.

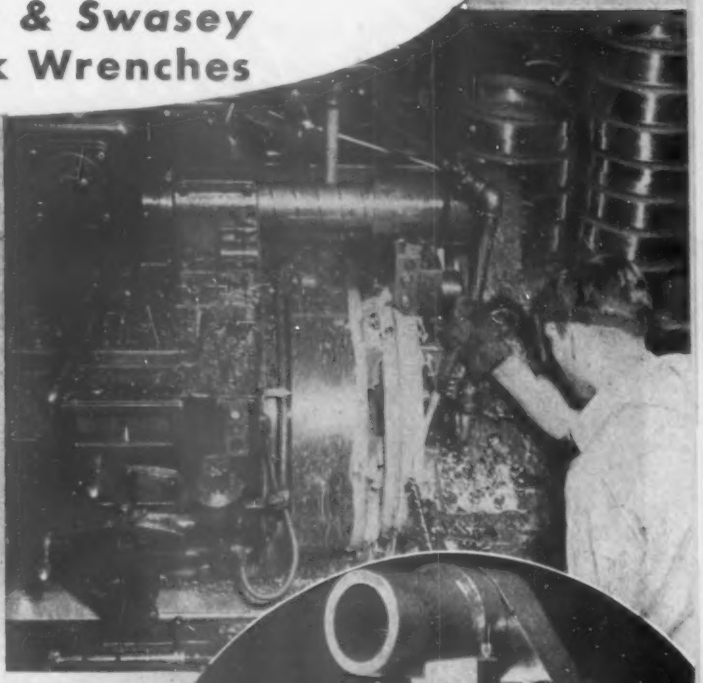
How many hours must steel remain at sub-zero temperatures?

●It seems that all that is required is to reach the desired temperature. It is unlikely that anything happens while the steel is held there because the transformation takes place during actual reduction in temperature. Once the low temperature is reached, the tool may as well be removed, provided of course that it is completely cooled throughout.

Save Time and Plenty of it

with Warner & Swasey Power Chuck Wrenches

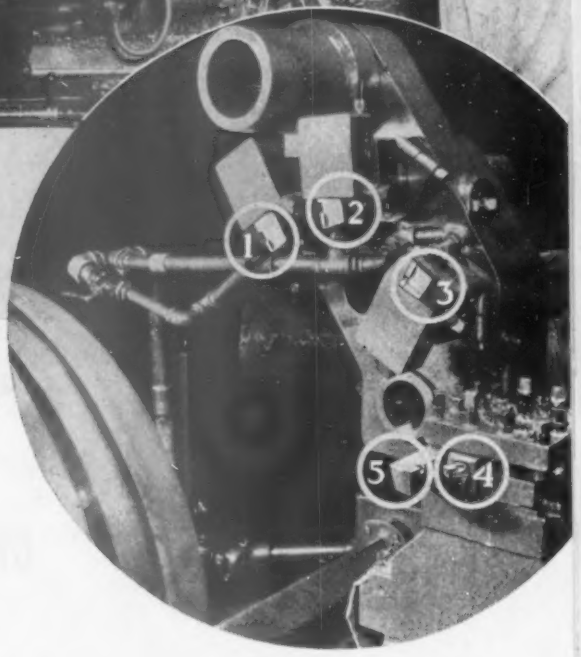




A turn of a knob chucks this large ring forging.

Chips fly under heavy multiple cuts at high speed.

Five simultaneous cuts (see photo) on tough steel forgings require maximum chucking grip that only a power chuck wrench can give.



AT The Steel Improvement & Forge Company, Cleveland, Warner & Swasey Power Chuck Wrenches are saving better than 60% chucking time on heavy ring and crankshaft forgings.

Hand chucking—heaving with an extension on a hand chuck wrench—is back-breaking work and takes all of 3 minutes per piece. Warner & Swasey Power Chuck Wrenches are chucking these pieces in about 55 seconds. All the operator need do is turn the convenient control knob—as easily as turning a door-knob—to get the proper chucking pressure.

The work involves deep, wide cuts that, at 140 surface feet per minute, take a lot of metal off tough steel forgings that have been heat treated to 302 to 321 Brinell hardness. In one operation, five heavy cuts are made simultaneously—totaling 1⅜" in width by ⅛" in depth. In another, a heavy interrupted facing cut is made. These time-saving operations would be impractical—yes, impossible on pieces chucked by manual strength. The piece would slip, tools would be broken, work spoiled.

Learn what Warner & Swasey Power Chuck Wrenches can do for you

Here's a way to make work easier for your operators, reduce "fatigue-sag", and get faster production and closer finished pieces on heavy duty turning. A Warner & Swasey field engineer will be glad to study your metal turning operations and advise you on the results which you may expect by putting Warner & Swasey Power Chuck Wrenches on your current model turret lathes. Call the nearest Warner & Swasey representative or write Warner & Swasey, Cleveland 3, Ohio.

WARNER & SWASEY
Cleveland

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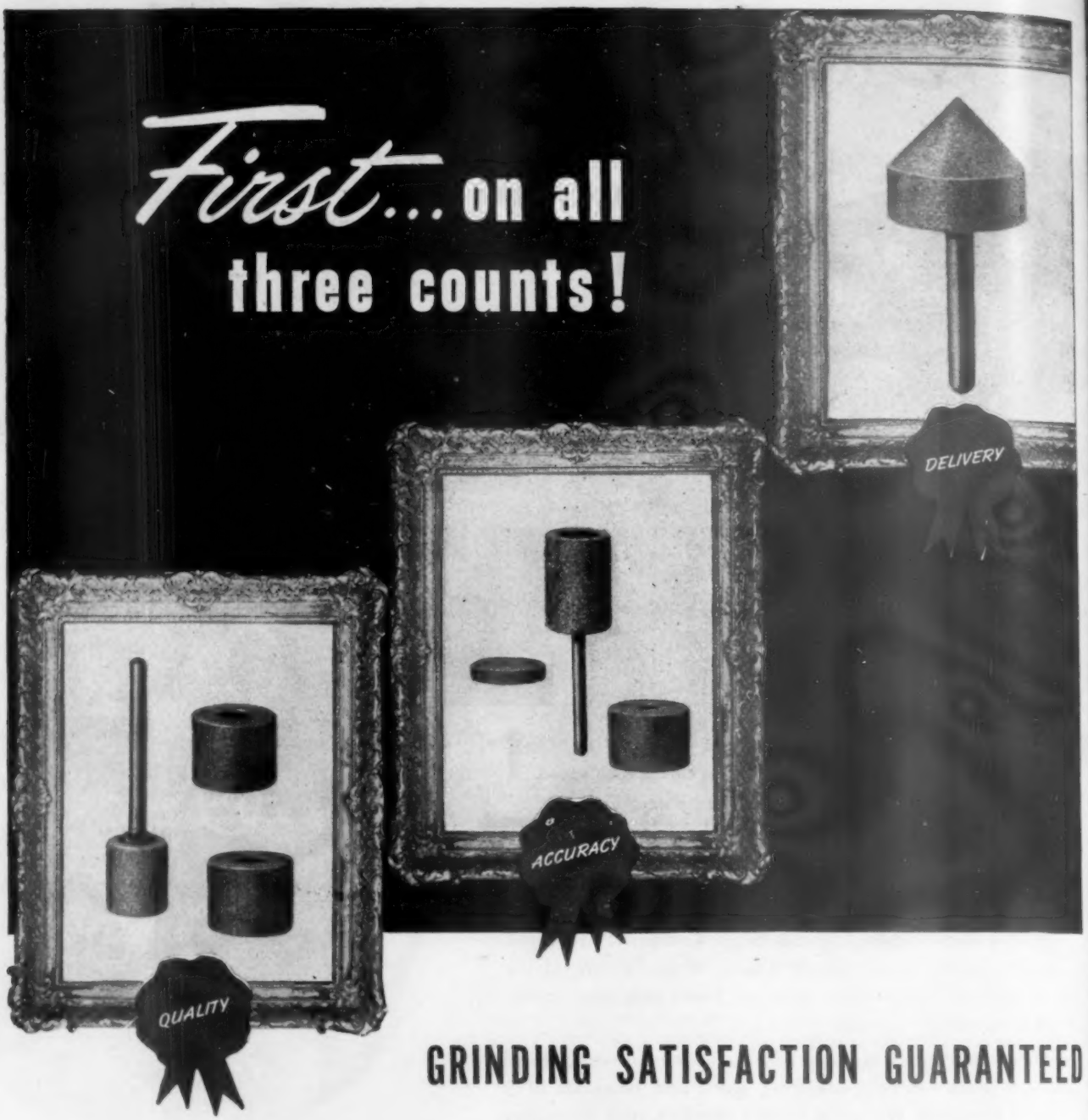
TURRET LATHES, SADDLE AND RAM TYPES—CHUCKING AND BAR TOOLS—
TAPPING AND THREADING MACHINES



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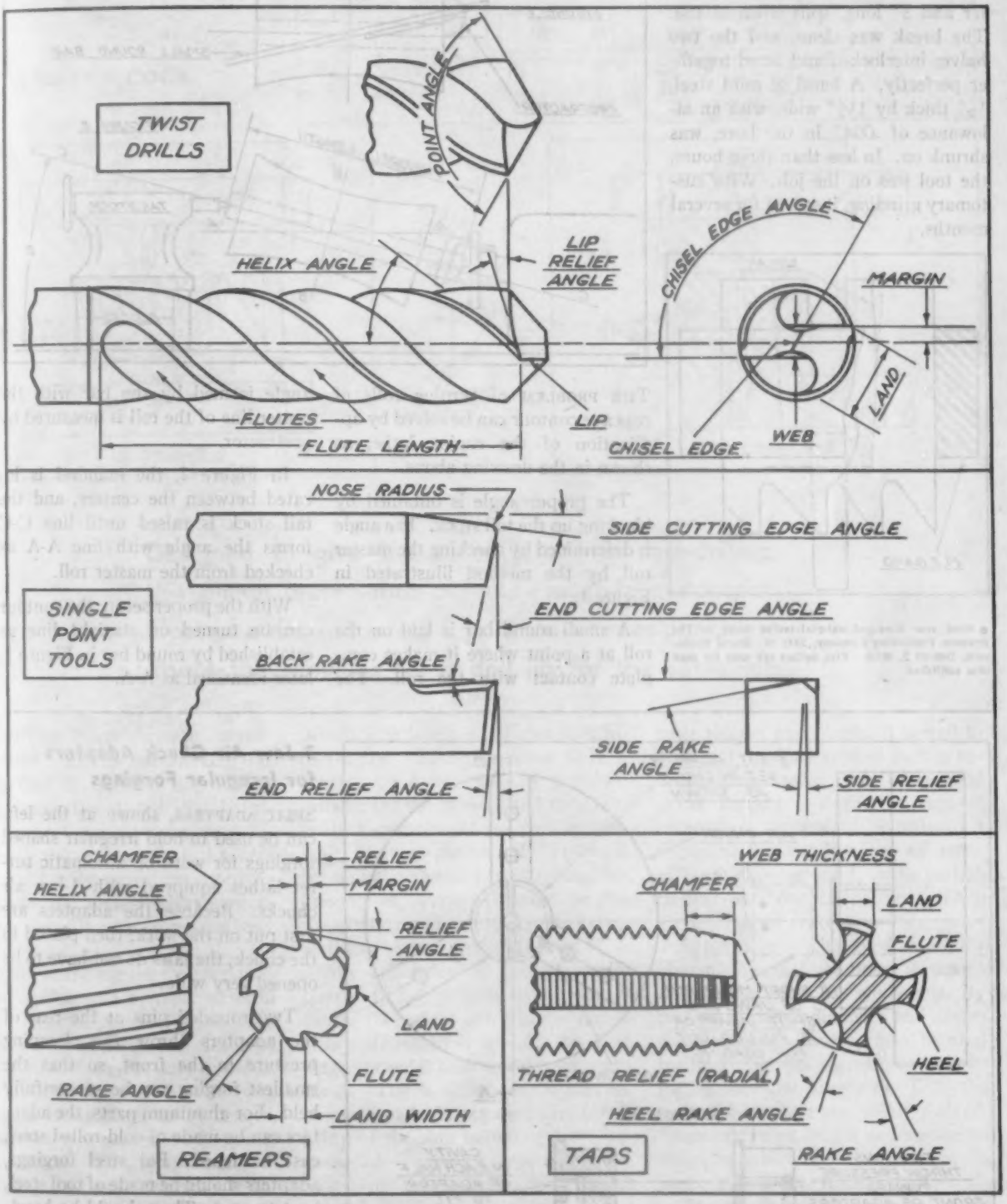
PRODUCTION DATA SHEET

CUTTING TOOL TERMINOLOGY

• With the tremendous interchange of ideas which has resulted from the country's war production program, there has naturally been give and take in the design of cutting tools. Some variance has been noted in terms applied to design features. Definitions given here for twist drills, single point tools, taps, and reamers, are approved by the American Standards Association.



NOTE: This is the thirty-sixth of a series of Data Sheets to be published in THE TOOL ENGINEER. A handy three ring binder can be secured at any dime store to hold the sheets for quick reference.

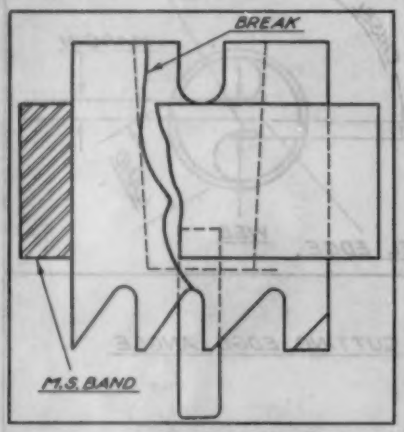
THE CRIB

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

IDEAS - KINKS - SHORT CUTS

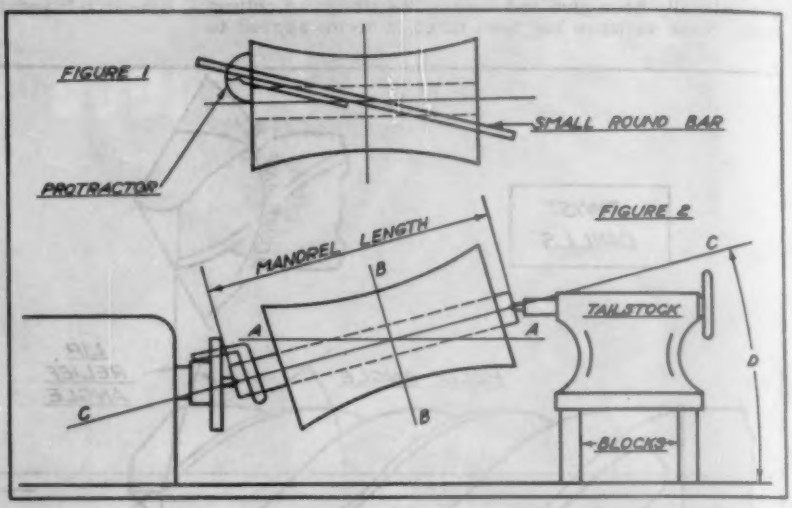
Repairing Broken Spot-Facing Cutter

A SPOT-FACING cutter, 2½" diameter and 3" long, split when in use. The break was clean, and the two halves interlocked and fitted together perfectly. A band of mild steel, ½" thick by 1½" wide, with an allowance of .004" in the bore, was shrunk on. In less than three hours, the tool was on the job. With customary grinding, it served for several months.



● Send your time-and-material-saving ideas to The Bramson Publishing Company, 2842 W. Grand Boulevard, Detroit 2, Mich. Five dollars are paid for each idea published.

Turning Concave Contours on the Engine Lathe



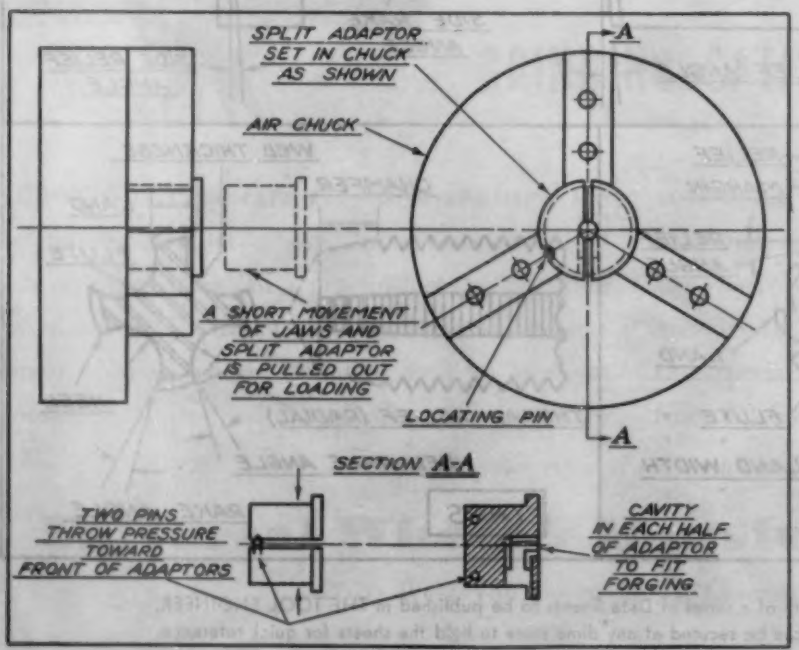
THE PROBLEM of turning rolls of concave contour can be solved by application of the engine lathe, as shown in the drawing above.

The proper angle is obtained by blocking up the tail stock. The angle is determined by checking the master roll by the method illustrated in Figure 1.

A small round bar is laid on the roll at a point where it makes complete contact with the roll. The angle formed by the bar with the center line of the roll is measured by protractor.

In Figure 2, the mandrel is located between the centers, and the tail stock is raised until line C-C forms the angle with line A-A as checked from the master roll.

With the proper setup, the contour can be turned on straight line as established by round bar in Figure 1, later identified as A-A.



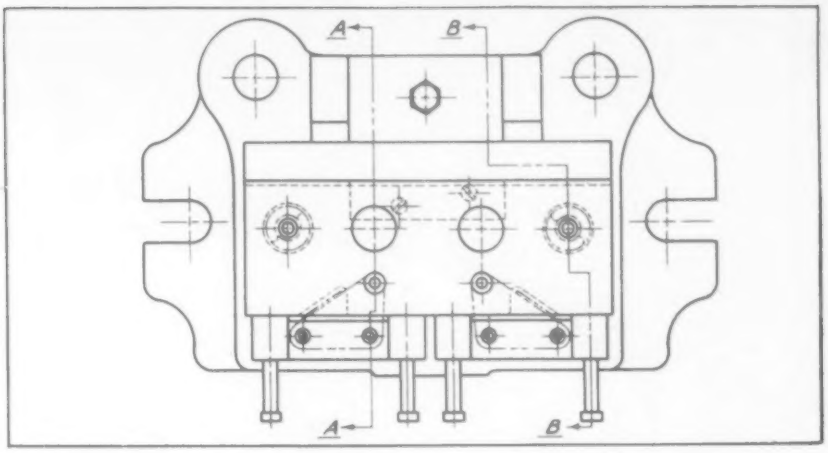
3-Jaw Air Chuck Adapters for Irregular Forgings

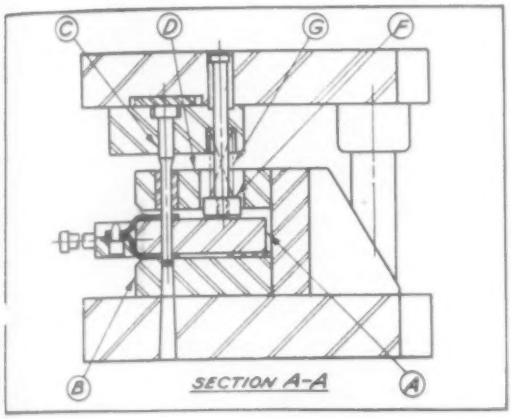
SPLIT ADAPTERS, shown at the left, can be used to hold irregular shaped forgings for work on automatic turret lathes equipped with 3-jaw air chucks. Because the adapters are first put on the work, then placed in the chuck, the jaws do not have to be opened very wide.

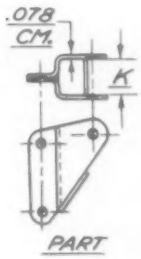
Two rounded pins at the rear of the adapters throw the clamping pressure to the front, so that the smallest forging can be successfully held. For aluminum parts, the adapters can be made of cold-rolled steel, case hardened. For steel forgings, adapters should be made of tool steel, heat treated. They should be hand-filed to fit minor irregularities in the work.

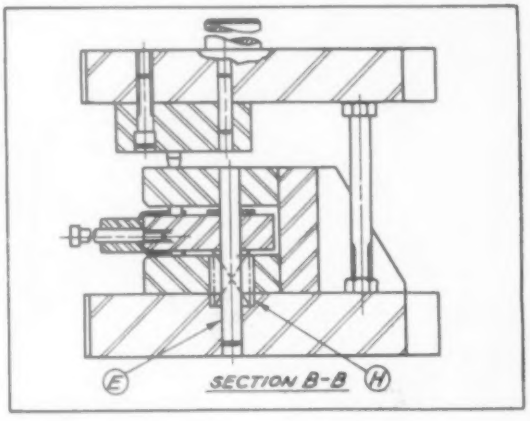
LINE-PIERCING

WESLEY F. COOK









Designed to give the same results as line-drilling, this punch press setup permits a much higher output. Cost of a die and a well-supported slender punch are about the same as for a drill jig for the same job

OUTPUT OF PARTS per man- or machine-hour by line-piercing far exceeds that obtained by line-drilling in the conventional drill jig. Fabrication cost of the die remains comparatively the same as that of a drill jig or jigs for the same operation. As illustrated, the design and construction of the die are comparatively simple.

Success of the die lies in specification of no clearance or taper relief in die A. Instead, punch C is produced to a sliding fit in die A, and clearance and taper relief are cut only in die B.

Because the punch is relatively slender in comparison to its length, it is necessary to give it good support and guidance. This is accomplished by guiding the punch through a bushing in stripper plate D. The bushing and punch are lapped to a slip fit.

Die A is floated on guide pins E to permit free insertion of the part into the die. Spring pressure pads F contact die A head of the punches, causing the die to close and thus preventing springing of the part by passage of the punch. To prevent springing of the part in stripping, the pressure of springs G must be less than the stripping pressure, but greater than the pressure of springs H.

Any difference in the two holes pierced in this manner is not apparent to the naked eye. Since punch C is a sliding fit in die A, the first slug punched is thoroughly confined in die A. Die A, closed on the part by pressure pads F, removes any possibility of the slug becoming free. Because of confined compression, the first slug theoretically becomes as hard as the punch behind it, and pierces a clean hole with no difficulty.

Although the punch appears to be quite slender and fragile, it is well to note that the load applied to it is entirely compressive, and that good shank support and guiding support reduce any tendency to buckle to a negligible factor. Punches are made of high chrome steel, with carbon content of about 1.5 per cent. They are ground on centers.

Application of this type of die for piercing channel sections, brackets and similar parts are numerous. By control of punch diameter and clearance, this type of setup may be used to line-pierce before reaming. Limiting factors are dimension K of the part and the hole size to be pierced. Obviously, shut height and stroke required will increase or decrease in direct proportion to dimension K.

The particular die illustrated, as well as others of its type, have produced thousands of parts without incurring die trouble. THE END

STARRETT BAND SAWS

STARRETT presents the new "Skip-Tooth" Metal Cutting BAND SAW

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Like all Hacksaws and Metal Cutting Band Saws bearing the STARRETT name, this new "Skip-Tooth" Band Saw *cuts faster, lasts longer.* It has the regular Starrett hard edge, flexible back construction, permitting higher speed sawing while retaining its cutting edge. It fits any band saw machine. The Starrett "Skip-Tooth" Saw is good for a whole lot of clean, high speed cutting. Use it until it's worn out. Then put in another one. No resetting or resharpening expense.

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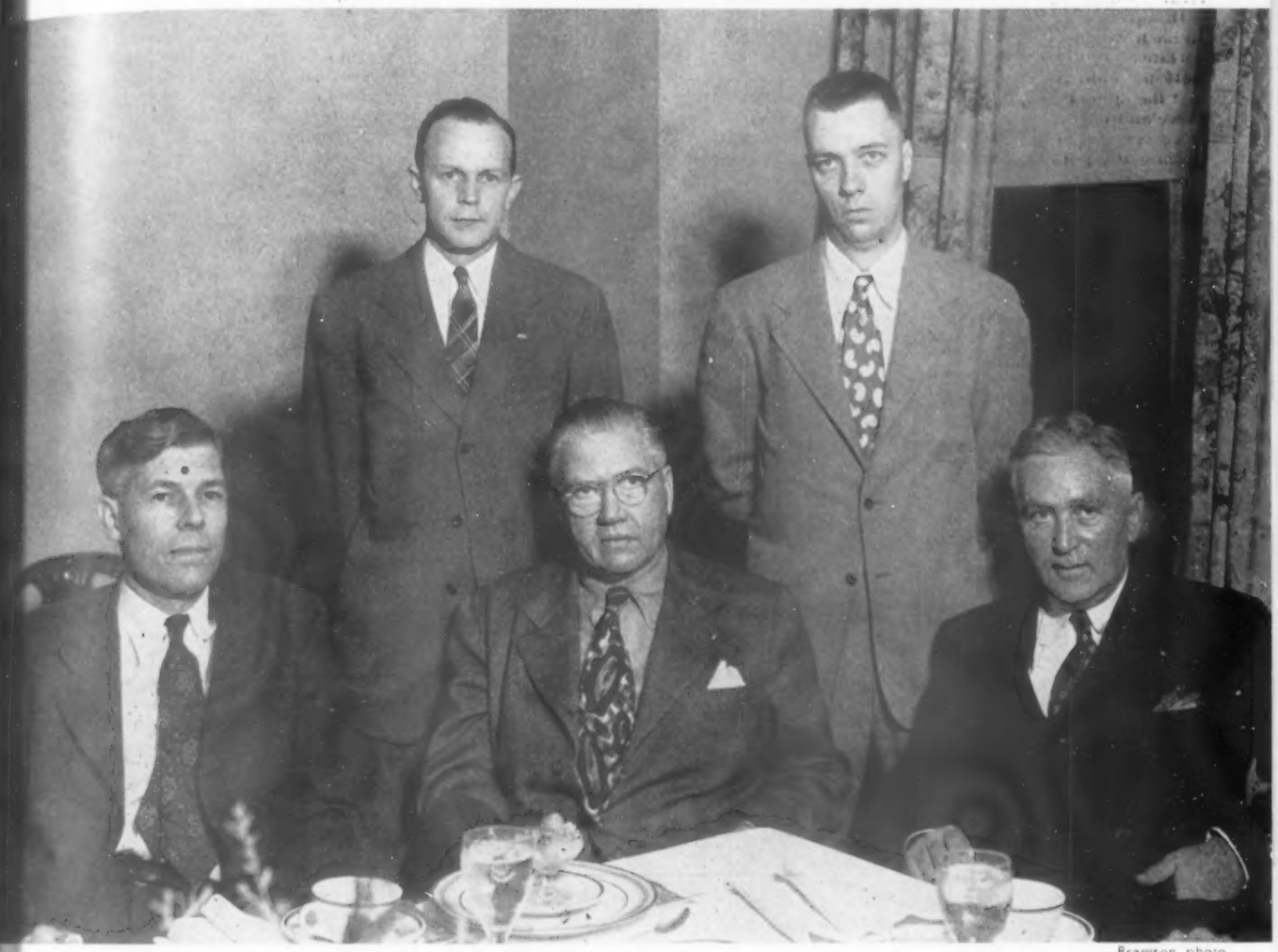

Bramson photo

Five top executives from as many Cleveland industries met with the Editors of this magazine for the sixth in a nation-wide series of PRODUCTION Round-Tables sponsored by The Bramson Publishing Company. *Seated, left to right:* Larry H. Grutsch, Works Manager, Cleveland Tractor Company; William E. Tabb, Plant Manager, Jack & Heintz; and Harry L. Adams, Assistant to the President, Weatherhead Company. *Standing, left to right:* Gordon N. Gray, Plant Engineer, Bryant Heater Company; and James G. Moore, Production Manager, Thompson Aircraft Products Company.

CLEVELAND PRODUCTION EXECUTIVES CITE SIGNIFICANT POSTWAR TRENDS

INDICATING the possibility of new and interesting trends in postwar utilization of metal-working equipment and mass manufacturing techniques, five outstanding production executives from the Cleveland industrial area offered the benefit of their long experience and personal judgment at the most recent PRODUCTION Round-Table.

The sixth in a nation-wide series of technical forums conducted by the publishers of this magazine, the meeting was held August 29, in the Ohio city. Participants in this Round-Table probably represented the most diversified cross section of mass production industry to confer with Bramson Staff Editors since this novel editorial project was undertaken last April.

Brought together to offer personal opinions on the questions posed in the recently completed production poll of the Metal-Working Industry, and explain their respective votes in that nation-wide survey recently conducted by the Editors, the five participants came from as many industries turning out widely divergent products.

The men who met for a four-hour-long session following a dinner at the Hotel Cleveland were James G. Moore, Production Manager, Thompson Aircraft Products Company; William E. Tabb, Plant Manager, Jack & Heintz; Harry L. Adams, Assistant to the

PRODUCTION ROUND-TABLE

PRODUCTION ROUND-TABLE

Coming from widely diversified manufacturing backgrounds, five top executives in Cleveland confirm trends indicated in the Bramson Production Poll of the Metal-Working Industry

President, Weatherhead Company; Larry H. Grutsch, Works Manager, Cleveland Tractor Company; and Gordon N. Gray, Plant Engineer, Bryant Heater Company.

In agreeing to speak for publication on such widely discussed topics of importance to the future of the metal-working industry, it was understood that the opinions expressed by all of the Cleveland conferees were personal and in no sense should be construed as reflecting the policies of the companies they represent. As a result, each man at the Round-Table felt free to speak frankly, basing his judgment solely on his own experience in production management.

LARGEST MACHINE TOOL USERS

All of the companies represented at the meeting are among the largest users of machine tools and metal fabricating and handling equipment in Cleveland area. Consequently, the varying responses to the questions posed by the Editors may be interpreted as reflecting the different production backgrounds represented. These backgrounds include such war and peacetime products as aircraft and automobile engine parts; flight instruments, electric motors and mechanisms; home and industrial heating units; farm implements and earth-moving machinery; and screw machine products and volume output of parts and fittings for hydraulic assemblies.

Though discussion covered numerous current and postwar metal-working and mass production problems, the basis of this Round-Table was the seven questions in the Bramson Publishing Company's Production Poll of the Metal-Working Industry. Having polled the more than 20,000 "first" readers of this magazine on subjects of vital interest to users and producers of metal-working equipment (see **The Tool Engineer** magazine, September, 1944, page 106), the Editors were anxious to present full explanations for the vote from a group of outstanding users of machine tools.

While the vote of the Cleveland conferees varied in several instances from the national consensus, this is most easily explained in light of the different production backgrounds and product fields represented at the meeting. Obviously, it was impossible for the thousands of production men who participated in the Production Poll to explain why they voted "yes" or "no". The Cleveland Round-Table gives those men an opportunity to compare their reasoning with that of others in similar industrial capacities.

EXPRESS OPINIONS ON POLL QUESTIONS

Here are the questions posed at the Cleveland Round-Table, the percentages of "yes" and "no" answers obtained in the nation-wide survey, and the consensus of opinion among this group of production engineers.

1. Do you envision greater precision in postwar manufacturing?

Nation-wide poll results: 88.63 per cent "Yes", 11.37 per cent "No".

Four of the five participants at the Cleveland meeting answered "yes" to this question, but individual expressions of opinion on the subject tended to temper the possible assumption that an immediate and revolutionary change in postwar precision standards is contemplated.

Despite the fact that many production men have proven to their own satisfaction that some of the tolerances required in war material are unreasonable, Adams of Weatherhead said, many companies have had an education in precision manufacture during the past two years.

"Application of this knowledge," he said, "may result in higher prices on many articles for some time after the war. However, higher precision should lengthen the wearable life of these products."

Bill Tabb of Jack & Heintz voted "no" and expressed the opinion that product designers will get as far away from extreme tolerances as possible in order to boost production. He pointed out that there might be two distinct classes of producion after the war. In one class, high cost precision would be maintained. In the other, production managers would try to get as far away from excessive precision as possible in order to boost output.

Moore of Thompson Aircraft Products foresees a generally higher level of precision after the war, but pointed out that he views the subject from the standpoint of one whose normal product requires close tolerances. In a company whose peacetime and wartime products are similar, he said, many tolerances on the same parts will be reduced after the war. As a result, production costs will go down, but the reliability and quality of the product will be maintained in every respect.

Gray of Bryant Heater answered "yes". "Compared with those in our prewar product, the tolerances in our postwar product will be much closer. They should be approximately the same as in our war production," he said.

Postwar tolerances should be higher than most prewar standards in the opinion of Grutsch of Cleveland Tractor, but many of the excessive requirements written into war materiel specifications will be eliminated, he reiterated. "We won't have close tolerances where they are not needed," Grutsch predicted, "but where they are needed to produce a product that will give good service they will be close or closer than before the war".

2. Where advisable, will you replace prewar equipment with war-built of DPC equipment?

Production Poll results: 68.81 per cent "yes"; 31.19 per cent "no".

The Round-Table vote on this question was four to one that it would be used.

Adams cited the policy of one concern, whose normal production background principally is screw machine work, as probably typical of an overwhelming number of metal-working plants today.

It has been the practice of these concerns "since the beginning of the war", the Weatherhead executive said, "to toss out worn equipment and replace it with new in preparation for the day they go back into competitive manufacture."

Many companies, such as his own, he explained, have made surveys of their shops, singling out the poorer equipment and earmarking new, DPC units to replace old machines as soon as they can be purchased from the Government.

The Jack & Heintz production man said that his company was "designing its postwar product around the equipment it now has". He said his company already has surveyed its big Bedford, Ohio, plants, picking out that DPC equipment it can use in turning out its postwar products.

In explaining his outlook on the subject of DPC machine tools, Moore said, "Our product during the war is 90 per cent the same as we made before the war. Consequently, we expect to keep all of the new Government-owned machines if we can find business to keep them running."

As regards the single purpose equipment they were called upon to use on some of their special production war jobs, he said they were looking for ways to fit some of it into their postwar production plans.

Though Gray thinks that many industries will replace their old machines with DPC equipment, he added "As we do not have any DPC equipment in our shops now and our peacetime products require some specialized equipment, we doubt if any such equipment will be available from DPC pools".

Grutsch said Cleveland Tractor has little DPC equipment, the company having expanded and replaced old machines with its own money. Because many of its machines have been running 24 hours a day for the past three years, Grutsch said, they are probably wearing out "about five or six times as fast as they would in normal times. When you consider the inexperience of the operator you must use on some of

(Continued on page 136)

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MOVIES *for Industrial Peace*

. . . hard-learned lessons of quick teaching through eyes and ears can be applied to reconversion . . .

Aluminum fabrication, a dramatic view in "Aluminum: Fabricating Processes"

HARASSED executives, charged with training thousands for war work, implemented their work with movies and slide films. Looking back, we know the job was well done. Looking forward, we see an equally big task of training for reconversion.

Retaining old employees; adding skills for new hands; teaching supervision new processes; adding to the knowledge fund for technical personnel; acquainting sales forces with unfamiliar products; inter-company exchange of fundamental information—all these are future training problems.

To meet changed conditions, The Tool Engineer magazine commends use of visual aids to learning, feeling that those executives who have not used films in their training programs may be overlooking a useful tool for increasing employee skills, building morale, selling company policies.

Aluminum Fabrication Graphically Shown

● **"ALUMINUM: FABRICATING PROCESSES"** A movie that starts with aluminum in ingots and shows how it is changed by men and machinery in hundreds of shapes. Material forms treated include plate, sheet, foil, bar, rod, wire, cable, structural shapes, hydraulic extrusions, tubing, impact extrusions, forgings, pressings, sand, die and permanent-mold castings, screw-machine products and paint pigments.

Each step is carefully explained.

In the 19-minute presentation, the light metal is shown in use in cables, structural shapes, tubing and ornamental forms. Pictures by animation, cover the widest possible range of application.

The second reel shows containers being produced by hydraulic extrusion and shows forging methods for obtaining high strength. Three processes of casting are covered. The reel closes, after many interesting studies of the metal, with scenes depicting laboratory research and testing. Other scenes show applications of completed aluminum products in use in home and industry.

The picture was prepared by the U. S. Bureau of Mines in cooperation with Aluminum Company of America. This is one of a series on aluminum. Available in 16-mm and 35-mm, both silent and with sound.

Write: Louis F. Perry, Bureau of Mines, 4800 Forbes Street, Pittsburgh, Pennsylvania.

Film Depicts Growth of Engine Industry

● **"CONTINUOUS PERFORMANCE"**: A film of historic and educational value has been released by The Cooper-Bessemer Corporation. It traces development of the firm's engine production 110 years.

The film depicts transition of the concern through earlier "reconversions", touching important decisions of yesteryear that still influence the industry. Interest is maintained through what amounts to a personally-conducted tour of the firm's two plants.

The 28-minute picture should serve as an inspiration for executives who must decide reconversion policies, for there is definite value in knowing what others have done in industrial crises. Available in 16 mm and 35 mm with sound.

Write: The Cooper-Bessemer Corporation, Mt. Vernon, Ohio.

Uses for Electronic Controls Depicted

● **"USES UNLIMITED"**: Of an institutional nature, this full color movie sequence provides assistance in several distinct industrial marketing problems. It approaches the problem of making plant operations interesting by hinging many of the factory scenes on uses of the product itself in manufacturing operations.

Switches will be at the heart of all new electronic devices promised for the postwar world, the sponsor says, and those engaged in any form of engineering will find the film stimulating, engrossing, informative.

The story is of Micro Switch, another chapter in the romance of American business. It begins in the not too favorable years just prior to World War II, with the introduction of a new tool for precision control of electric circuits. It shows how this tool was custom built to fill a constantly increasing need for a link between mechanical motion and an electric circuit and how new uses multiplied.

Within limits of war security the film shows applications of the switches in ships, tanks, trains and motor vehicles. The alert production engineer will likely find ideas to apply to postwar production jobs.

Running time of the film is 40 minutes. Size is 16 mm.

Write: Micro Switch Corporation, Freeport, Ill.

Welding Stainless Alloy Topic for Sequence

● **"WELDING STAINLESS STEEL"**: A two-reel movie has as its purpose the teaching of welding students as well as welders familiar with carbon steel welding, fundamentals of working with stainless steels.

Primarily intended to explain stainless steel welding in simplest terms for shopmen, there is much to interest the most experienced metallurgist or fabricating engineer. Unusual are extreme close-ups of the arc at work, greatly magnified so the action of protective flux and the very melting of the rod metal can be seen.

Action of "Welding Stainless Steel" begins with comparison of differences between the alloy and ordinary steel. Step by step preparatory work is covered, showing how to obtain sound weld joints. Key points are pointed out. Laying beads with one pass of the arc, two-sided welding, as well as multiple bead welding on heavy gauges, are thoroughly explained and further clarified with appropriate charts.

Size of the film is 16 mm. Running time 25 minutes.

Write: Allegheny Ludlum Steel Corporation, Brackenridge, Penna.

THE END

DAWSON KENNARD GRANT FLETCHER GORDON CROTSLEY WELLMAN ELLINGSON

YINGLING PATTERSON WEARN WIBERG SHULL LENOX SCOTT PERKINS

A.S.T.E. MEETS AT SYRACUSE

ELABORATE use of the symposium, successfully inaugurated a year ago, will mark the Twelfth Semi-Annual Meeting of the American Society of Tool Engineers at Syracuse, N. Y., October 11, 12, 13 and 14 according to Adrian L. Potter, Executive Secretary.

Another convention feature on a larger scale this time will be plant visitations. Managers of 15 Syracuse factories have rolled out the welcome mats—contingent on their plants being in operation during convention time.

Built around the convention theme of "Produce for War, Prepare for Peace", committees have planned a program fitted to these uncertain times. There is some feeling that decisive actions may transpire before convention dates and every effort has been made to keep symposium presentations on widest possible interests consistent with substance.

COMMITTEE PREPARES WELCOME

Reports from the host chapter at Syracuse indicate that a determined effort on part of the Reception Committee will result in orderly welcoming of delegates. Committeemen expect to meet trains and buses to greet and direct delegates from the society's 65 chapters.

An order of business during the convention will be selection of host city for the next semi-annual meeting. Cleveland will be site of the Annual Meeting in March.

Registration will highlight opening day, October 11. Convention delegates will register in the Main Lobby of Syracuse Hotel. Standing committees will also meet to prepare convention reports. Time and place for committee meetings will be announced later.

Registration will continue Thursday, October 12, and the Board of Directors will conduct its meeting. Standing committees will also call sessions.

Friday, October 13, beginning at 9 a. m., a symposium will be conducted

. . . semi-annual meeting will consider production problems in peace and in war . . .

by representatives of International Business Machines Corporation. Subject will be "Production Control and Costs". Speakers will be W. E. Crotsley, Director, Manufacturing Control Education; and S. E. Lenox, Assistant Superintendent, Tool Division. Donald Babcock will preside.

After lunch, G. N. Morceau, Elmira Chapter, will preside at sessions of "Magnesium". Otis E. Grant, Production Control, Magnesium Division, Dow Chemical, will open with "Magnesium Production and Fabrication". He will highlight growth of the industry, discuss finishing, joining and assembling the metal.

Following Grant will be E. Howard Perkins, Brooks & Perkins, Detroit, Mich., on the subject "Fabrication Methods for Assemblies of Magnesium Sheets and Stampings". He plans to approach his subject through problems of fabrication of assemblies of magnesium alloy sheet and extrusions from the standpoint of practical manufacture. Perkins holds that magnesium alloys have many useful applications but are not metallic panaceas.

The concluding address will be presented by Carl J. Wiberg, Supervisor, Special Process Division, Production Engineering Department, Wright Aeronautical Corporation, Paterson, N. J. His Topic will be "Machining Magnesium". After treating briefly the history of magnesium use in the Wright organization, he will describe general foundry practice, treatment of cores and molds, cleaning and heat treating. He will include descriptive data on various machining practices. The paper will conclude with cleaning and slushing, dichromating and chrome pickling for corrosion prevention and preparation for paint.

The evening session will begin at 7 R. E. Crawford of the Toronto Chapter is scheduled to preside. Symposium title is "Operating a Branch Plant in Canada". Three speakers will share the time.

Opening on "Production", W. A. Dawson, Chief Inspector, Otis-Fensom Elevator Company, Ordnance Division, Hamilton, Ontario, will discuss types of machines available in Canada, machine service available, effect of British standards and other typical Canadian problems.

He will be followed by E. N. Wearn, Superintendent, Canadian Acme Screw & Gear Company, Toronto, on "Personnel". This paper will treat on labor rates, unions, placement aids and bonus system.

Edward Kennard will close the session with a paper on "Management". Kennard is Vice President and General Manager, St. Catharines Steel Products, Ltd., St. Catharines, Ontario. He will treat with problems of finance, cost and capitalization.

INSTRUMENT EXPERTS TO SPEAK

"Tooling Instrument Work for Factory Production" will be topic for morning sessions Saturday, October 14. Speakers represent Eastman Kodak Company. C. G. Newton of Rochester chapter will preside. First paper will be, "The Panoramic Sight, Its Construction and Use in the Field", presented by Francis M. Shull, Optical Engineer. He will be followed by Paul G. Yingling, Process Engineer, on the topic "Machining, Assembly and Testing Methods used in Optical Manufacture".

Third speaker William R. Gordon, Chief Tool Engineer will talk on "Interesting and Unusual Tools Used in the Manufacture of the Panoramic Sight". Training Supervisor Howard C. Wellman will present a paper "Training Supervision and Unskilled Workers for Instrument Assembly".

(Concluded on page 142)

See this New 30-Minute Movie and Save Months of Postwar Planning

This new Gorton Sound Motion Picture, in colors—"An Exact Duplicate"—shows latest techniques on many jobs like those you'll tackle after "V-E Day."

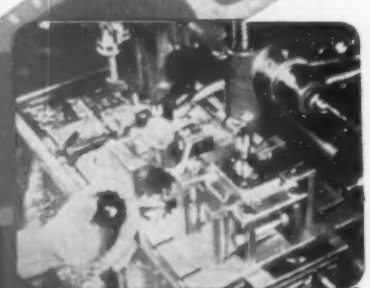
Yes, the 30 minutes that you'll spend seeing "An Exact Duplicate" may give you the practical solution to that tough postwar production problem that is on your drawing board today. This motion picture, filmed in color and sound under actual machine shop conditions, shows Gorton Tracer-Controlled Machines *in use* on plastic die and mold jobs, forging dies, high production profiling, milling, 2 and 3 dimensional engraving and manual and electric duplicating.

Available now without charge—for showing to technical societies, company groups, conventions, training schools, and other organizations. Write us today for further information, giving choice of three tentative dates.

(Above) Complex irregular shapes and contours are easily duplicated from inexpensive plaster models.

(Above) Flexibility of Duplicator Control solves many industrial pr[illegible]

(Above) A revolutionary idea in grinding.



(Above) It is simple to do production profiling of parts which must be held to close tolerances.

GEORGE GORTON MACHINE CO.

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For the First Time...

WRITE YOUR OWN SPECS!

STANDARDIZED AIR GAGE SPINDLES AND COMPONENTS

Sheffield Precisionaire spindles, adapters, etc., within certain limits, have now been STANDARDIZED so that any user can make up his own specifications almost as easily as he does for AGD plug gages.

Engineering time and charges are eliminated on STANDARD spindles and components. Delivery is shortened considerably. Components are interchangeable within certain size ranges which means minimum initial purchases and gage inventories.

The STANDARD Precisionaire checks internal diameters of long, short, through, blind or counterbored holes. Both tolerance limits are checked in one operation faster than either can be checked with a plug gage—and without the human element of error. Precisionaire spindles will outwear plug gages 10 to 40 or more times.

Write for Engineering Data No. 12 on Sheffield STANDARDIZED Precisionaire Components and SPECIAL applications.

CAPITAL COMMUNIQUE

T. N. SANDIFER

Special dispatch from The Bramson Publishing Company's Correspondent in the nation's capital

WASHINGTON

THERE has been so much talk of "V" Day and "V-E" Day, that some of the more cautious production men here have felt called upon to bring attention to still-going production needs.

It was generally overlooked in Acting Chairman J. A. Krug's statement at War Production Board recently anent cutbacks of 40 percent when Germany is defeated, that he put a string on this reduction schedule. They will be spread over perhaps a year, he indicated, in regard to the large curtailments that everyone sees as inevitable when the war actually ends.

Before the end of hostilities, Krug said as emphatically as he could, "We are going ahead full blast on war production as long as the need for war production exists. We also plan to be in shape to change over to civilian production when the time comes for us to do it."

WPB THINKS INDUSTRY IS READY

Another thing to be remembered about cutbacks is that they are going to be equalized over the country as far as practicable. And, with the war still on at this writing, there is no disposition in more realistic quarters to name any specific date as a probable "V" Day.

Nevertheless, the brakes will be taken off to an increasing extent to enable industries in a position to do so to resume normal operations. The feeling around Acting Chairman Krug's office in this connection is that most major industries are far more ready with plans and equipment to swing over than the public has been led to realize.

The surplus bogey is still prominent in Washington, however, and Office of War Mobilization Director Byrnes paid considerable attention to it in his recent outline of what V-E Day would mean. He cited the need of clearing away war equipment and war inventories in plants that were otherwise ready to turn to civilian output.

FAVOR SMALL INDUSTRIES

Among other things he touched on was the use of this surplus of war goods, including factory equipment, to perhaps build up industries in less heavily-industrialized areas of the country.

This clearly indicates that the Government would have to arrange this setup. No industrial group could do it. This implies also that less conservative elements in Washington would control disposition of plants and equipment left from the war, since others having this problem at hand appear to favor selling off the goods and plants in the manner most favorable to the taxpayer as well as in favor of industries that would suffer from surplus goods on their peacetime markets. Machine tools are frequently mentioned in this connection, as they have been many times before.

The latest development of this idea is that smaller concerns would be given a certain degree of preference in buying surplus equipment and machine tools. They would also be aided in other ways by the Government to become efficient producing units in industry, able to compete, so far as equipment goes, with larger organizations.

The line being taken by advocates of help to smaller concerns was developed during work on the two principal surplus war property disposal bills, which are still under discussion by House and Senate conferees. A member of the War Production Board staff, C. C. Fichtner, commenting on some of the ideas advanced, said,

"In our observation, many small manufacturing businesses are handicapped by old and obsolete machinery. It would be most helpful to the future of small plants if the program of disposal placed higher-quality Government-owned surplus machinery and machine tools in their hands.

●WPB's new chief, J. A. Krug, is pushing harder on a program to recruit an additional 217,000 new workers in "must" munitions jobs. Those jobs include heavy tires, big shells, heavy trucks, combat transport and carriers, foundry products, airborne radar, and heavy artillery.

Meanwhile, plans are underway for a 40 per cent cutback in total war production as soon as Germany quits. Concerns to be cut will get quiet advance tip-offs.

"It would lower their unit costs, increase their competitive positions, and reduce pressures on wage rates. A machinery modernization program would be furthered by some kind of exchange provision of new for old machines which could be scrapped or sold in regions of the world where cheap labor makes use of such machinery economical."

This last idea is not endorsed wholeheartedly by everybody who has studied the various proposals. In general, this phase of handling excess machine tool equipment would involve re-tooling of small business all over the country, and still leave machines for new business, that might also want equipment.

To maintain the competitive position of American industry, strengthen the capacity of smaller business concerns, and expand production, it is proposed by some that surplus new machinery could be offered to manufacturers in exchange for their old equipment. The latter could be shipped to those parts of the world where the level of industrial development would make no difference whether the machinery were the latest model in use here or not. In other words, even some of our older models are ahead of anything these areas abroad might know about.

To facilitate any such operation, specific legislation was asked for the Smaller War Plants Corporation, for instance, giving it the power of exchange. Smaller concerns could then release their older equipment, which could be shipped out for rehabilitating some less industrialized part of the world, and could get new machinery from surplus.

EXCESS MACHINE TOOL PROBLEM

The opposition to such a plan is largely based on sentiment. It is only a side-issue in a way, to the broad plan of re-tooling all American industry from surplus, or from new production, which is very much in the forefront of current discussions.

However, as one member of Congress put it, we have in this country modern machinery that can produce a national income of from $150 billions to $200 billions from goods. Furthermore, we have the machine tool capacity to make tools in two or three years to meet all our own ordinary requirements plus our exports. On this ground, this argument is that it is not necessary to ship any old stuff out of the country.

Some machine tool men have followed the line advanced by some automotive industry executives. The latter have said they would like to have everything that is to be sold moved out of the way now, before new production starts. On this point, Senator Taft told some committee colleagues recently that in talking to some machine tool men, he learned, "In the machine tool industry you probably have one of the largest surpluses there is."

On that ground, he said, it was his impression that machine tool executives also want the excess tools sold now, if they are going to be sold at all. As one of them pointed out, "Most of our business is going to be special work, and we will have that. There is going to be a great amount of special machines made for new tools, and as far as special machines are concerned, these other tools should be sold immediately."

DIVIDED OPINION AMONG BUILDERS

This school of opinion is that if surplus machine tools continue in the hands of the Government, it will interfere seriously with the sale of new machines, because the prospective buyers will be thinking that if they wait, they can get Government machines at half price.

On the proposition of re-tooling smaller plants then, there is a certain division, with some machine tool manufacturers believing that perhaps it will be better to let plants get new machines and get rid of their old equipment, and others strong for freezing all such surplus equipment for an indefinite period.

(Concluded on page 111)

—CAPITAL COMMUNIQUE—

(Concluded from page 109)

maybe years, to keep it out of the way. Other industry men, including some users of heavy equipment, believe it would not harm the market to ease some of these surplus items out gradually. There is considerable evidence that manufacturers are thinking of retooling in many cases.

Meanwhile, Defense Plant Corporation, a subsidiary of the Government, has announced that it will sell either for cash or on a deferred payment basis, machine tools and other production equipment that have been declared surplus, whether owned by itself or other government agencies.

Sales will be hedged by such restrictions as a ban on speculators, and all purchasers being required to put the tools or equipment into use and to employ a reasonable number of people in their use. No sales for re-sale or similar purposes will be allowed.

MACHINE TOOL STATISTICS

Some idea of the number of machine tools on the market is indicated by the latest compilation of machine tool shipments from January, 1942 to December, 1943. These show the following:

Boring machines, total, 9,697 units in 1942, 7,278 in 1943; broaching, 1,007 units, 1942; for 1943, 802; drilling, 47,654 in 1942; 41,581 in 1943; gear cutting and finishing, 6,435 units in 1942, 6,186 in 1943; grinding, 54,009 units in 1942; 52,810 in 1943; lathes, including automatic screw machines, 88,878 in 1942; 80,196 in 1943; millers, 47,565 units in 1942; in 1943, 30,819; planers, 981 in 1942; in 1943, 618; miscellaneous, 50,960 units in 1942; in 1943, 45,559. This adds up to a total of 307,186 machine tool units in 1942, and 265,849 in 1943.

The miscellaneous item includes shapers and slotters, key-seating machines, honing and lapping machines, cut-off and sawing, contour sawing and filing, rifle working, tapping and threading, and other such units.

There is a little-known side to all this talk about what to do with excess machine tool equipment. Under a recently-written opinion of the Attorney General, according to an interpretation of it by the War Production Board's general counsel, it might be actually impossible for machine tool industry groups to plan too freely for distribution of available machine tools. This would mean that the Government would almost be left alone to deal with the problem.

INDUSTRY ADVISORY COMMITTEES

Specifically, the Attorney General has held that certain activities of industry advisory committees might be greatly circumscribed by the anti-trust laws, and the WPB counsel, reading it over, pointed out that a careful observance of this view might preclude machine tool executives, for instance, from making plans for the equitable distribution of available machine tools and components to the consuming trade.

Actually, it may not work that way. There may have to be a certain amount of planning between machine tool builders and various industries as to who gets what equipment, and when, during conversion. THE END

MACHINE TOOLS

. . . news and trends in the Machine Tool Industry . . .

WPB Report Shows Decline in New Orders; Backlog Good

Shipments and new orders for machine tools during July moved down hill like a greased toboggan. Shipments fell 18.2 per cent compared with June, according to WPB Tools Division figures, while the value of new orders dropped 33 per cent below the previous month's total.

On a dollar and cents basis, July shipments were valued at $33,916,000 as compared with $41,471,000 in June. The value of new firm orders, less cancellations, decreased to $33,224,000, compared to the June value of $49,578,000.

Though shipments and new orders continued to decline, the backlog of unfilled orders remained virtually unchanged. Value of the backlog was set at $194,588,000 or 0.1 per cent above the June backlog of $194,450,000. As the rate of new orders declines, the percentage and value of monthly cancellations likewise declines. Orders cancelled in July were valued at $4,056,000, a decrease of 6.8 per cent from the June cancellations of $4,354,000.

Despite the fact that new business is dropping, builders still enjoyed a healthy backlog at the end of July. At that month's rate of shipments, it would require fully five and one-half months to clean up the orders on hand.

RFC Figures Are Released on Surplus Tools Disposal

WASHINGTON—Latest reliable figures on how much of the Government's growing bank of surplus machine tools is being disposed of were contained in a statement by W. L. Clayton, Surplus War Property Administrator.

During July, he said, RFC disposed of $1,665,000 worth of machine tools. Of the 5,215 machine tools declared surplus up to August 15, a total of 4,595 was sold. Surplus machine tools held by Government agencies on that date were valued at $4,000,000.

Thus far, Clayton said, both the RFC and Treasury Procurement Division have realized a high percentage of the original cost in the disposal of surplus war properties.

RFC has arranged for sales of machine tools on terms of 15 per cent in cash and the balance to be paid in small monthly installments bearing four per cent interest.

Stumbling Blocks Still Exist on Road to Reconversion

CLEVELAND — Coincident with WPB's August reconversion order permitting machine tool users to place unrated orders for postwar equipment, it was widely assumed that the machine tool industry had turned the corner and was starting down the road toward normal peacetime operation.

Reports from various machine tool centers now indicate that, though the industry may have turned the corner, it is going to be a very long road back. First stumbling block is wording of the WPB order making it mandatory that the builders clear their books of war jobs, or, at least, work themselves into a position where they can do the postwar job without interfering in any way with good delivery on war orders.

Figured at the current rate of output, the builders are still faced with almost six months of war contracts for machine tools.

Then, it became apparent a few days after the order went into effect that it contained still another joker. This is the fact that Regional WPB offices that are screening users' unrated orders for postwar machines, are crossing off all units that can be obtained from current stocks of Government-owned surpluses. Consequently, few orders for new standard machine tools are being received.

As a result, the bulk of the new orders being received by the builders are for special units, designed and engineered for specific jobs, and not generally obtainable from surplus war stocks.

As of this writing, almost all of the unrated orders received by the builders have come from the automobile industry, where missing special machines will hold up resumption of passenger car production until those machines are built and delivered.

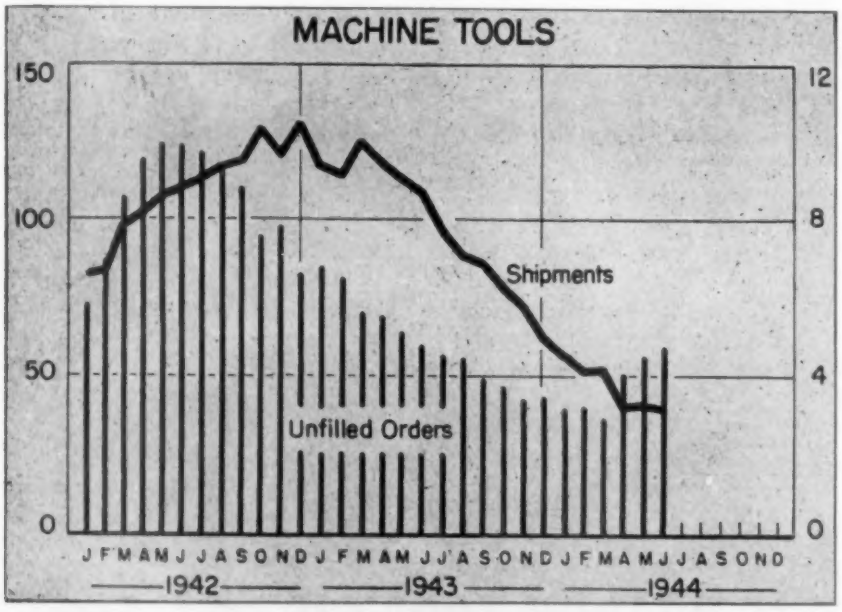
Two concerns have definitely announced that they have placed orders for all of the critical machine tools they will need to get back into production.

General Motors, known to be in need of more than 1,000 critical machines, without which it cannot go into even limited output, has placed orders for all of them. Except for a very few machines, GM President Wilson told this magazine recently, all of the orders have been approved by the various Regional WPB offices to which they were submitted. A definite promise of satisfactory delivery date on any one of the units ordered, he said, has not been obtained from a single machine tool builder.

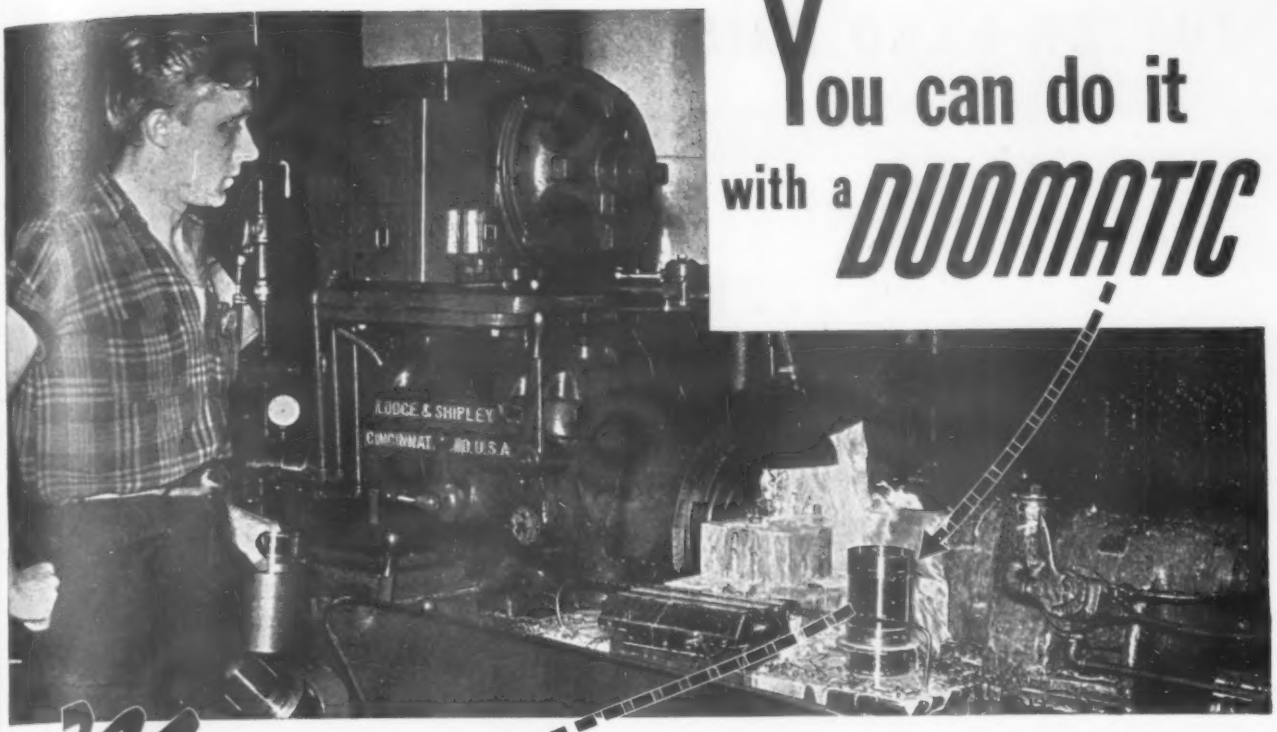
Studebaker is the other concern which has announced that it has finished placing its initial order for machine tools necessary to get back into auto production. It has been estimated that Studebaker's initial requirements for critical machines could not exceed several hundred.

General Motors, who in normal times ordered as many as 3,000 machines a month, owned a total of 75,000 machine tool items before the war. In the war production scramble, the Corporation lost around five per cent of this total to other war industries. A substantial portion of the 3,750 units that had been lost during the war, GM executives say, must be recovered in the form of new machines before more than extremely limited passenger car production can be undertaken.

THE END



After both shipments and unfilled orders for machine tools dropped precipitously throughout 1943, a sharp change in trend appeared early this year. By June, as shown above, shipments had dropped to $41,331,000. On the other hand, unfilled orders rose to $192,782,000 by June after a wartime low in March. Time required to clear the backlog at the rate of current output likewise rose to more than five months.



You can do it with a DUOMATIC

Machining cylinder barrels for RANGER AIRCRAFT ENGINES

Lodge and Shipley's Duomatic Lathes continually demonstrate remarkable versatility in meeting the special or standard problems of the aircraft industry. For example, in machining the revolutionary cylinder barrel used in Ranger aircraft engines.

This new aircraft engine cylinder barrel, developed in Fairchild's Ranger laboratories, permits an important increase in air-cooled engine horse-power. With Fairchild's unique "Al-Fin" process, the steel cylinder core is *chemically bonded* with an aluminum "Al-Fin" muff, permitting faster engine cooling. To machine these new cylinder barrels with the required speed and precision, Lodge & Shipley Duomatics were selected.

The Duomatic is a full automatic lathe, with dual tool slides which can be operated singly or together. (See photo at left.) This permits more advantageous use of multiple tools—front and rear—in turning, and in straight and angular facing operations. For better, more profitable performance, call on Lodge and Shipley Engineers, or write on your company's letterhead for Bulletin 601 FL.

THE LODGE & SHIPLEY MACHINE TOOL CO.

CINCINNATI 25, OHIO, U. S. A.

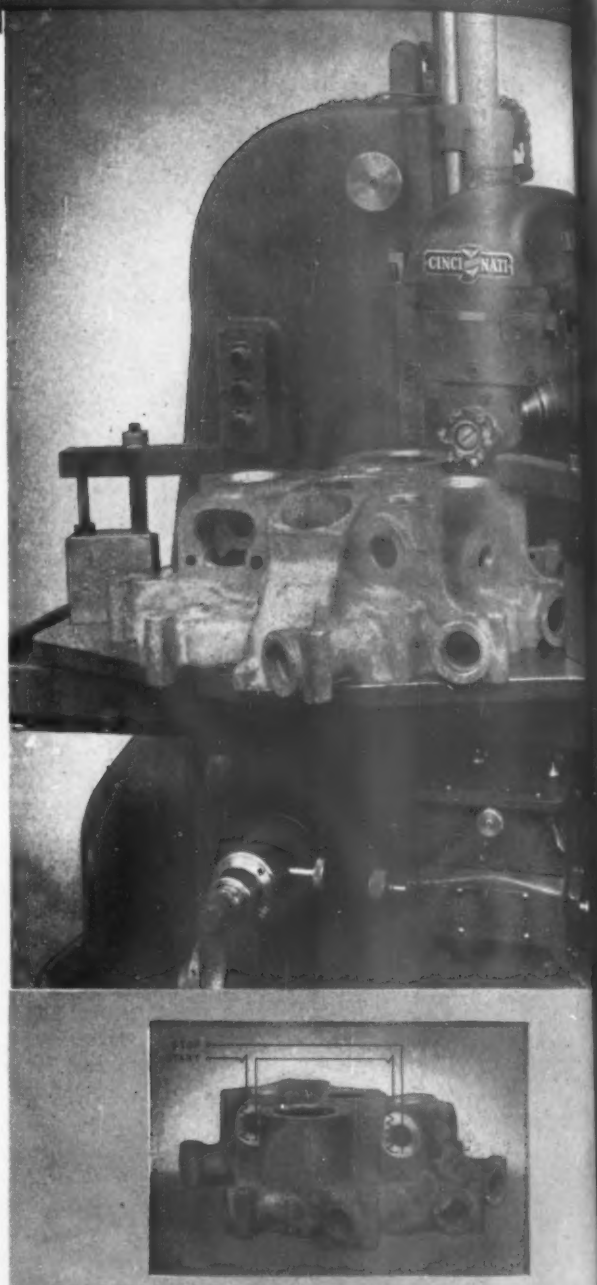
L & S LATHES

ENGINE • AUTOMATIC • TOOL ROOM • OIL COUNTRY LATHES

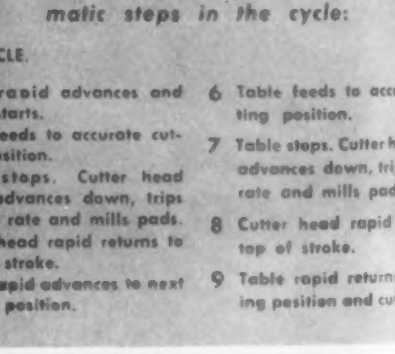
CUTTER HEAD RAISES *Automatically*

allowing OBSTRUCTION to pass

In addition to automatic table feed cycles, the CINCINNATI No. 2-24 Automatic Rise and Fall Milling Machine offers this important advantage: *down feed of the cutter head, synchronized with the table feed cycle.* This extra feature is especially useful where there is an obstruction between milled surfaces such as the bulge in the crankcase casting between the two milled pads, as shown in the illustration below. Special equipment to handle this job included: fixture, cap type arbor support to fit over extended shell end mill, and special cycle selector to mill down in two accurately located positions of table. ¶ This setup was developed by the CINCINNATI Application Engineers who will be glad to discuss your milling problems with you in an endeavor to work out a more accurate or more economical way of handling them.



Above Right: *Milling two pads on rear crankcase for aircraft engine. The machine is a* CINCINNATI *No. 2-24 Automatic Rise and Fall Miller. After loading the fixture, the operator merely flips the starting lever and nine functions of the milling cycle follow automatically, including return of the table to the starting position.*

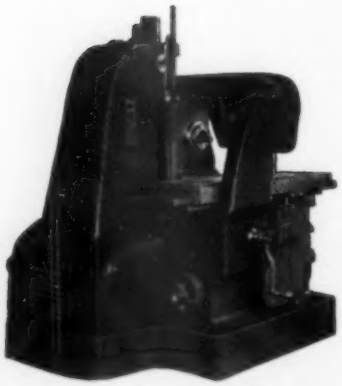


Illustrated at the right is a close-up of part being milled on the equipment shown in the photograph above. Also shown is a diagram of the automatic cycle.

Here are the nine automatic steps in the cycle:

START CYCLE.

1. Table rapid advances and cutter starts.
2. Table feeds to accurate cutting position.
3. Table stops. Cutter head rapid advances down, trips to feed rate and mills pads.
4. Cutter head rapid returns to top of stroke.
5. Table rapid advances to next cutting position.
6. Table feeds to accurate cutting position.
7. Table stops. Cutter head rapid advances down, trips to feed rate and mills pad.
8. Cutter head rapid return to top of stroke.
9. Table rapid returns to starting position and cutter stops.



Above: CINCINNATI *No. 2-24 Automatic Rise and Fall Milling Machine. Catalog M-909-1, giving complete specifications, is yours for the asking. For a brief description of all* CINCINNATI *Milling Machines, look in Sweet's Catalog File for Mechanical Industries.*

CINCINNATI

THE CINCINNATI MILLING MACHINE CO. CINCINNATI, OHIO, U.S.A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES... SURFACE BROACHING MACHINES... CUTTER SHARPENING MACHINES

INDUSTRIAL NEWS DIGEST

. . . a review of significant developments and new techniques in mass production industries . . .

First Civilian Production Approved by WPB

WASHINGTON—First approval of civilian production under the WPB-WMC "spot authorization" plan was announced September 6.

Manufacture of steel septic tanks, metal signs and Class "B" coal stokers for civilian consumption was approved by WPB field offices. None of these jobs involves additional labor or new materials.

The Johnson Company, Houston, was authorized to make septic tanks requiring 120 tons of steel per quarter from excess stocks. Production will amount to 900 units per quarter, and will require approximately 10 persons.

The Electrical Products Consolidated, Spokane, has been authorized to make metal signs. This work requires the services of 20 persons.

Heating Assurance, Incorporated, Spokane, will manufacture Class "B" stokers. The company has been permitted to make 50 units during the fourth quarter, and about 125 stokers during each of the first two quarters of 1945. It employs about 15 persons, and has the materials and parts needed to make the stokers.

Eighty-one of the 95 WPB field offices have reported to Washington that they have received 457 applications to undertake civilian production, through the end of August. These are being processed as quickly as decisions can be reached by the area War Manpower Commission representatives and the Area Production Urgency Committees as to the availability of materials and labor, WPB has announced.

Krug Moves to Nelson's Desk, Announces Top Assistants

WASHINGTON—Facing its most serious internal problem since the Hillman-Knudsen split, the Government's top war production agency is today struggling through a reorganization of executive personnel in preparation for "V-Day" and reconversion.

President Roosevelt's dispatch of Donald Nelson to China having left the top executive position in WPB open, J. A. Krug has been appointed Acting Chairman of the WPB.

Sentiment is strong here that Nelson was sent to the East in a "flying doghouse". Despite the fact that the President refused to comment on whether the former Sears Roebuck official would return eventually to his old post in WPB, his appointment of 37-year-old Krug as Acting Chairman of WPB is believed even in the war agency itself to mean that Nelson will be given "other important assignments".

The voluntary departure of General Electric's Charles Wilson from Number Two position in WPB having left another gapping hole in top personnel, Krug immediately scoured the industrial front for one or more capable assistants. Within a week after taking over his new job, Krug announced his find: A. H. Bunker, former Executive Vice President of the Lehman Corporation, as Chief of Staff; and Hilland G. Batcheller, President of Allegheny Ludlum Steel Corporation, as Chief of Operations.

Krug, who started his Government service with the TVA, was loaned to the old OPM and moved on into the WPB, has been a Lt. Commander in the Navy since April.

The new Acting Chairman said he contemplated no further basic changes in his organization, and that he and his two appointees would act as a team to work with the various Program Vice Chairmen so that the agency could "move ahead rapidly with our already far-advanced conversion plan."

Bunker and Batcheller both have WPB experience. "Mr. Bunker, as

(Continued on following page)

NOVEL SNAP GAGE RACK

The problem of storing snap gages conveniently was solved at General Electric with this unusual rotating rack.

● A tier of circular wooden shelves mounted on a turntable now provides storage for 400 snap gages at General Electric's Fort Edward plant. The rack is unusual for its accessibility and minimum utilization of floor space.

C. S. Laughlin, Planning Department, devised this tier with shelves spaced to accommodate variously sized gages. Separators between gages also act as spacers for the shelves.

The tier is mounted through the center on an iron pipe resting on a ball bearing and running through a roller bearing at the top. Rack is rotated by gripping a pipe rail around top and bottom shelves.

"GREENIE" *The First Million Are the Toughest*

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

(Continued from preceding page)

Director of the Aluminum and Magnesium Division for two and one half years," Krug said, "was substantially responsible for the extraordinary success of these two programs."

Batcheller, who pushed through the WPB's outstandingly successful steel program, returned to Allegheny Ludlum at the end of 1943 after reorganizing the WPB Office of Operations. "He has now come back to take his present position at my urgent invitation," Krug said.

Technical Program is Feature of National Metal Congress

CLEVELAND—In addition to a five-day technical lecture program, a series of 21 practical panel meetings on metal fabricating and treatment will be conducted by the American Society for Metals during the 26th annual National Metal Congress and War Conference Displays in Cleveland's Public Hall, October 16-20.

"Headed up by a panel of three to 10 top authorities in specific branches of the metal industry, each of these afternoon and evening sessions will be an audience-participation discussion of timely developments", according to W. H. Eisenman, National Secretary of the A S M and Managing Director of the Congress and Display.

These sessions, he said, are designed to evaluate new technologies and production speeding equipment developed during the war.

With some 200 industry leaders invited to participate in these panel discussions, more than 1,000 metal men are now participating in the 150 practical and technical talks planned by the five societies in the Metal Congress.

In addition to the American Society for Metals, sponsor of the event, these societies are the American Welding Society, the Iron and Steel and Metals divisions of the American Institute of Mining and Metallurgical Engineers, the American Industrial X-Ray and Radium Society and the Society for Experimental Stress Analysis.

Afternoon and evening technical sessions will be held in Cleveland's Public Hall, scene of the War Conference Displays. More than 300 manufacturers are planning exhibits ranging from ferrous and nonferrous metals to processes and equipment for their production fabrication, handling and treatment.

WEST COAST POSTWAR INDUSTRIAL EXHIBITION

More than 500 manufacturers were represented through their West Coast distributors at the Southern California Industrial Exposition, Los Angeles, September 2-10.

Typical of displays seen by more than 100,000 visitors was this prize winning booth in the Processing Division.

Southern California Industrial Exposition Declared Success

LOS ANGELES—The Southern California Industrial Exposition, believed to be the first postwar planning show in the nation, was held in the Pan-Pacific Auditorium here September 2-10. Attended by well over 100,000, it exceeded the expectations of both exhibitors and the management in attendance and interest. Many exhibitors, as well as others impressed by this show, have reserved space for the second Industrial Exposition tentatively planned for next June in the same location. Double the number of exhibits are anticipated then.

More than 500 manufacturers were represented in booths through their representatives and distributors, besides the showing of many products, processes and services by producers.

The exhibits included machine tools, hand tools, portable power tools and motors; electronic and television equipments; metal treating, welding and brazing; plastic products; stampings, castings and extrusions; metals; and handling equipment.

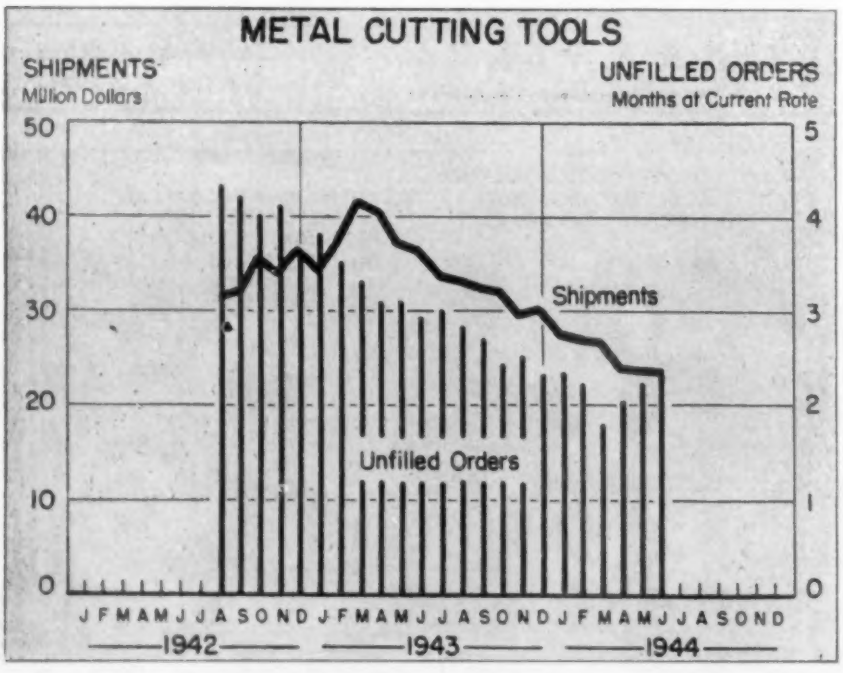
Exhibit Judges, who made awards in 20 industrial product fields were: Arthur J. Denis, Carbide Tool and Mfg. Company; Dick Linch, Lockheed Aircraft Corporation; Phil Coates, Mole-Richardson Company; Sam Hoffman, Knobe, Incorporated; and George Cashin, President, Factory Tool Supply Company.

(Continued on page 120)

IDEAS FOR VICTORY

● Are the men and women in your shops contributing to "victory know-how"?

More than 6,000 War Production Board commendations, honorable mentions, certificates and citations have been awarded to civilian war workers for their "production set-up ideas", T. K. Quinn, head of the WPB's War Production Drive program has revealed.



Contrary to scattered reports, cutting tools are still in heavy demand, according to the Tools Division of WPB. At the current rate of output, approximately two-and-one-half months would be required to clear away unfilled orders. New orders have been rising steadily since January.

DALZEN THREAD GRINDER, No. 5, WITH GUARDS REMOVED

IN THREAD GRINDING . . . THE *DRESSER'S* THE THING!

AUTOMATIC DRESSING IS PROVIDED IN THIS *New* DALZEN *Electronic* THREAD GRINDER

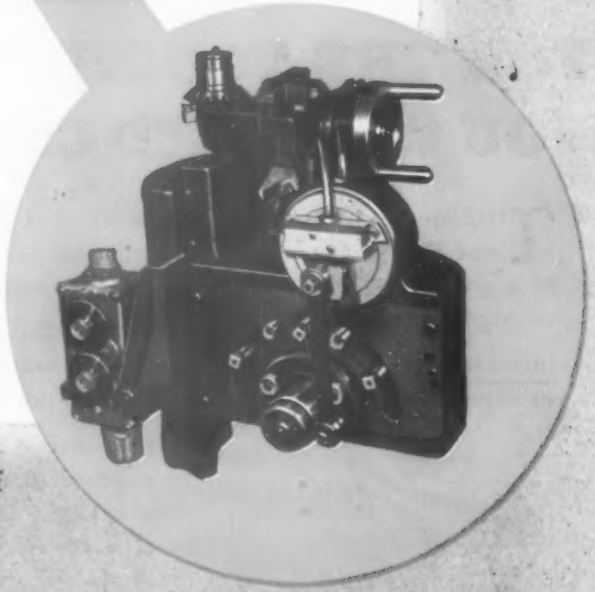
● Accuracy of a ground thread depends upon the accuracy of the dressed wheel. Precision, finish and production efficiency in thread grinding are determined primarily by the dresser.

DALZEN engineers always have recognized this fact. Now . . . the new DALZEN Electronic Thread Grinder presents the latest and best in dresser efficiency—offering new and special advantages in dressing performance.

The new DALZEN Thread Grinder with General Electric Thy-mo-trol drive provides maximum production of threaded parts, thread gages, straight and spiral fluted taps, and thread milling cutters. Grinding speed—both wheel and work—forward and reverse—is adjusted by the twist of a dial. Variation is infinite and stepless. It's an investment in *better* thread grinding, and a *low-cost* investment at that!

An attractive three-color folder describing the new DALZEN Models 5 and 6 will be sent you, free of charge, on request.

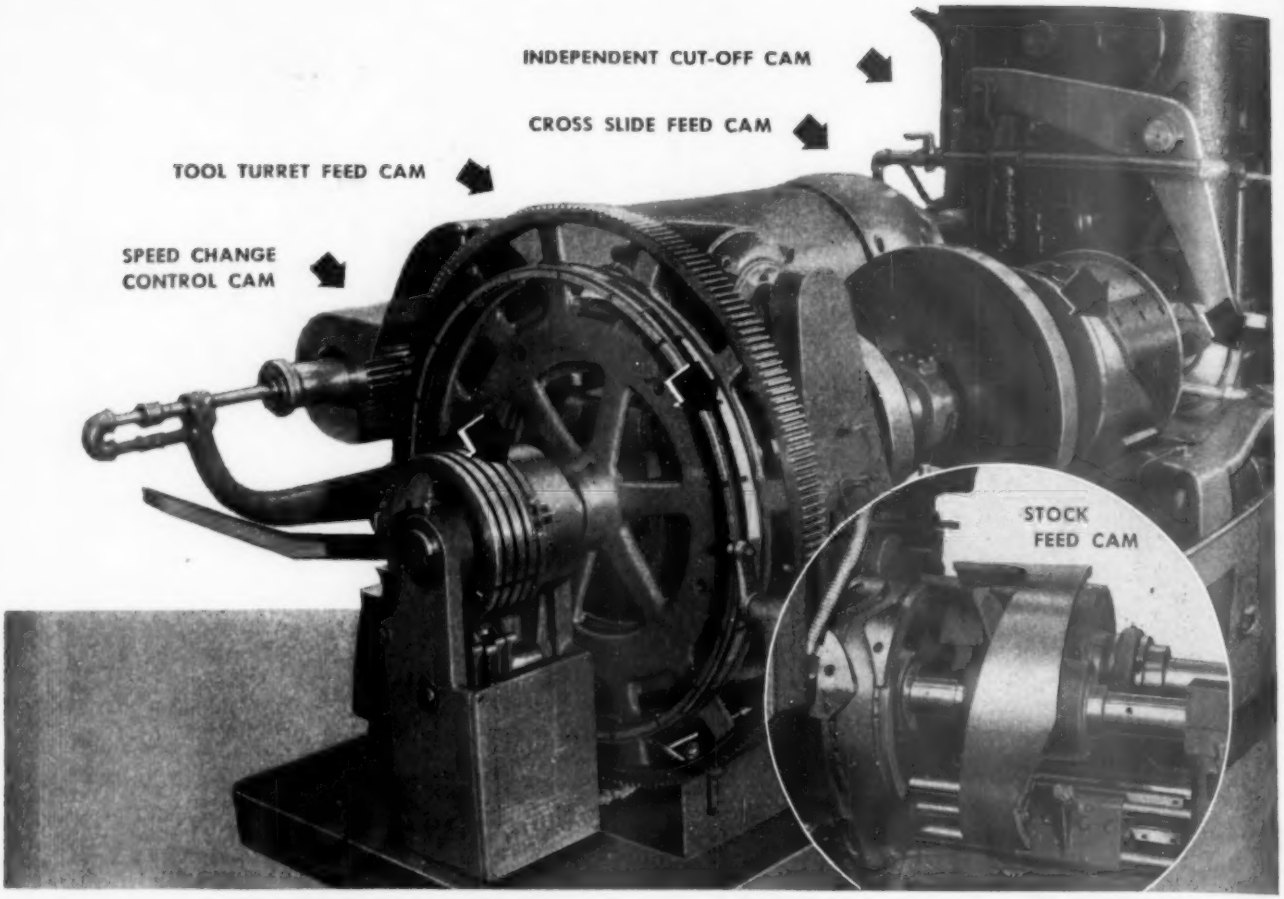
In addition to thread grinding machines, DALZEN also manufactures precision ground broaches, thread milling cutters, taps, threaded parts, and the Dalzen "2-in-1" combination center grinder and drill press. Write for descriptive literature.



DALZEN

TOOL & MANUFACTURING COMPANY

12255 EAST EIGHT MILE ROAD • DETROIT (5), MICH.



FOR THE TOUGHEST JOB (it's yet to come) YOU WILL NEED CLEVELAND AUTOMATICS

THE toughest production job for all of us comes AFTER culmination of the first big phase of the war. Directly ahead lies another big war job, plus the problem of satisfying the tremendous demands of a goods-hungry world . . . maintaining quality in the face of raw material difficulties . . . operating on higher labor costs . . . AND producing at a price that will meet the fiercest competition in history.

Increased efficiency of production is the obvious answer. That is why Cleveland Automatics play such an important role in the new economics of production.

Every operation on a Cleveland Single Spindle Automatic is controlled by standard cams, easily reached and quickly set to any position with the aid of a universal adjustment feature. The ratio of cost time to earning time is bettered by the speed and ease with which tools can be readied for productive operation. With men responsible for production, Cleveland Single Spindle Automatics have a reputation for two important advantages. 1. Maximum sustained low-cost production on long runs, with minimum down time for adjustments. 2. Profitable economy on small lot, short run jobs. Let us show you how it works out on one of your jobs.

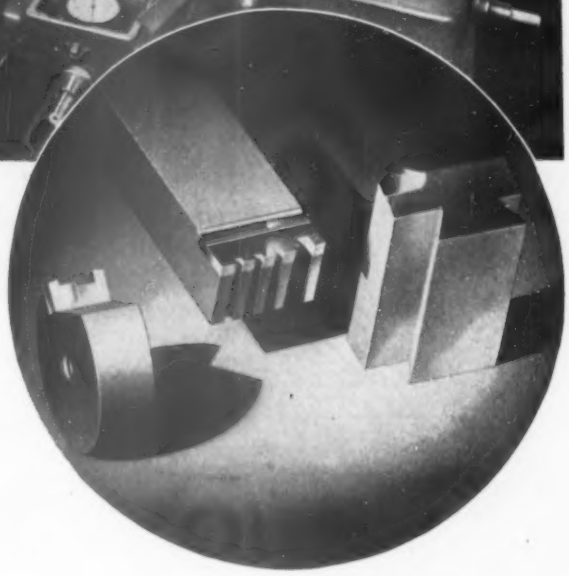
Just Remember, Cleveland's Cut Costs

CHICAGO (6):
1408 Civic Opera Building
DETROIT (2):
540 New Center Building
NEWARK (4):
902 American Insurance Bldg.
CINCINNATI (12):
4932 Beech Street
HARTFORD (1):
529 Capitol National Bank Bldg.

THE CLEVELAND AUTOMATIC MACHINE CO.
CLEVELAND 3, OHIO

THESE Wickman PRINCIPLES

Make Possible The ACCURATE GRINDING Of Profiles Such As These In Tungsten-Carbide Or Other Hard Metals



● The Wickman Profile Grinder has for a number of years proved exceptionally efficient for the grinding of irregular shaped contours on flat or circular form tools, male and female profile gages, punches, open and sectional die segments, etc.

● Accuracy is held to within ± .0005". This accuracy is not affected by wheel wear and no special shapes or radius dresser need be used.

● Finished parts can be checked against the layout without removal from the machine. Reversing the operations followed in grinding, layouts can be made of parts having previously undetermined profiles.

Literature Containing Full Information Is Yours for the Asking

THE Wickman CORPORATION

15535 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

INDUSTRIAL NEWS DIGEST

(Continued from page 116)

AIRCRAFT PRODUCTION

August Output Dips Slightly; Decline Anticipated

Because the armed forces have decided to make formal acceptance of planes after modifications for combat duty instead of at the end of the assembly lines, August production of aircraft showed a decline of 3.5 per cent below scheduled output. Planes accepted during the month numbered 7,939, compared with a July output of 8,000 ships.

Scheduled September output called for 7,934 planes, in accordance with the recently announced program of cutbacks. A total drop of five per cent in output is scheduled for the remainder of the year, nine per cent for the first half of 1945, and 15 per cent for the latter half of 1945.

Collapse of the European phase of the war, however, will radically modify this schedule. Further sharp cuts in production schedules can be expected, probably in line with the contemplated 40 per cent overall cutback.

For the present, emphasis on B-29 and B-32 four-engine, super-plane manufacture is pushing all other aircraft programs back, as is reflected by nation-wide reports of limited cutbacks and lay-offs in plants producing or contributing to smaller planes.

Climax Reached in Willow Run Story; Cutbacks Expected

DEARBORN, MICH.—The story of Willow Run has reached its climax. When the news leaked out that Henry Ford had done it again, that the big plant on the outskirts of the motor capital was turning out a plane an hour, early critics of the application of "automotive tooling" to aircraft work were strangely silent.

The 6,000th B-24 bomber built here rolled out of the plant September 9, almost two years to the day after the first Ford-built four-engine ship was completed. More than half of these planes have been built this year.

September's Willow Run schedule calls for a greater daily production than in any previous month. Thereafter, the big plant will begin to slow down from the 100-ships-a-week rate of output it has maintained recently.

When the armed forces announced that contemplated cutbacks in the B-24 program would release at least 12,000 persons from their jobs at Willow Run by December, the CIO hastened to Washington. There, the WPB hastened into action, but only to announce that every attempt would be made to move other aircraft work into the Ford plant. Such work, the Government agency said, would come from other shops that could be readily converted to civilian production.

In any event, it is plain here that unless some fast work is done in shifting other jobs into Willow Run, there will be fewer workers in the motor pioneer's bomber plant by winter.

(Continued on page 122)

(Continued from page 120)

INDUSTRIAL BUSINESS NOTES

News of Industry Expansions, Services, and Activities

Subsidiary: MetalFusion Corporation of America is now a subsidiary of Cook Electric Company. Announcement was made by Walter C. Hasselhorn, Cook President. William A. Ziebell is MetalFusion Manager, Clifton Cargile is Plant Superintendent of brazing and heat treating, and William S. Love is Chief Metallurgist.

* *

Sales: Russell, Holbrook & Henderson, Inc., has been appointed exclusive New England representative for George Gorton Machine Company, manufacturers of machine tools. Factory trained engineers are now available through the New York firm.

* *

Offices: Kennametal Inc., announces opening of offices at Kansas City and St. Louis, both under direction of R. B. Weeks, Chicago Manager. Lyle H. Wade will be representative at St. Louis and Ralph H. Craig at Kansas City.

* *

Purchase: Globe Products Manufacturing Company, Los Angeles, announces purchase of the entire machine tool line of Utility Tool and Die Manufacturers, including screw machines, turret lathes, cross slides, beds and turret and collet closers.

* *

Distributors: Ransome Machinery Company, subsidiary of Worthington Pump and Machinery Corporation, announces appointment of the following organizations as distributors of welding positioning equipment: Post Welding Supply Company, Birmingham, Ala.; Hobart Welder Sales & Service, Cleveland; W. P. & R. S. Mars Company, Duluth, Minn.; American Machinery & Supply Company, Omaha, Neb.; Arcway Equipment Company, Pittsburgh, Philadelphia, Baltimore and Richmond, Va.; Hobart Sales Service Supplies, Buffalo and Syracuse, N. Y.; and Peoria Welding Supply Company, Peoria, Ill.

* *

Frostrode: Increased demands for industrial refrigeration equipment has prompted Frostrode Products to move to larger plant quarters in Detroit. Boosted facilities will set delivery dates ahead on orders for the firm's products.

* *

New Company: Demco Tool Service, Glendale, California, to merchandise the products of machine and cutting tool manufacturers. Companies represented include: Genesee Tool Company of Fenton, and Detroit Tap & Tool Company, Michigan Tool Company, Colonial Broach Company, Tungsten Carbide Tool Company, Colonial Bushings, Inc., and New Methods Steel Stamps Inc., all of Detroit. Demco will be equipped to recondition tools and handle job broaching.

* *

Appointment: Moore Machinery Company will handle sales, service and engineering in the Los Angeles territory for Reed-Prentice Corporation.

(Continued on page 126)

Shaper grips the work in a vise, the cutting tool shuttles back and forth cutting on only one cycle. Each stroke makes one chip until the entire section removed is reduced to a worthless heap.

DoALL slices out the part to within .005 of the layout line, leaving the section removed in a solid, usable piece.

DoALL

DoALL is the contour sawing machine that is doing such a grand job of (both internal and external) metal shaping, saving hundreds of man hours and thousands of pounds of valuable material. Cuts tubing, blocks, bar stock or stacked sheets.

Here's one machine tool that won't require any change-over adjusting when civilian production is given the full go-ahead signal. So, get set now with one or a battery of DoALLS.

Ask for circular EIGHT DIFFERENT JOBS, illustrating DoALL versatility.

VISIT US at the METAL SHOW, CLEVELAND, OCT. 16-20


Contour Sawing


Band Filer


Super Surface Grinders


Grinding Wheels, Magnetic Chucks and Selectrol


Colloidal Cutting Oils and Soluble Oils

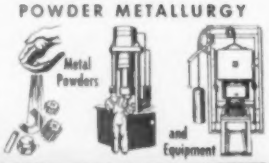

Dust Collectors and Coolant Systems


Variable Speed Pulleys, SPEEDMASTER


Band Saws


Band Files


Inspection Laboratory GAGE BLOCKS with Instruments


POWDER METALLURGY, Metal Powders and Equipment

DoALL

CONTINENTAL MACHINES, INC.
1304 S. Washington Ave. • Minneapolis 4, Minn.

Still Another Application of the No. 10 LeMaire Drilling Machine

ROUGH and FINISH BORING
—FACING (Fly-Cutting)—
COUNTERSINKING

All performed in continuous operation on one machine

Mounted on a standard No. 10 LeMaire Vertical Drilling Machine is a No. 5000 Twin Ram equipped with a LeMaire boring, facing (fly-cutting) and chamfering head. Here you have a complete machine that performs several operations at one setting with greater speed and accuracy than has ever been possible before.

As you know, conventional face milling cutters used on large diameters very frequently produce disappointing results because the vibrations that are set up cause chatter marks and inaccuracies in work.

This machine produces ten housings an hour at 100% efficiency with carbide tipped tools.

This is only one of the many ways in which these hydraulic units are combined with our standard drilling units to bring new efficiencies in production.

Think of the process as well as the product when you plan your postwar production. Let us explain the versatility of these machines.

How THE MACHINE OPERATES

A push on the starter button causes the head assembly to rotate as it approaches the work. After the unit drops into feed and completes the rough and finish boring of the 11.125 hole, "stop rings" on the guide bars stop the downward movement of the assembly but it continues to rotate and move the quill with the facing tools to "fly cut" across the work. A bell-crank then actuates the countersinking tool which feeds to depth and dwells before returning to unloading position.

LeMaire

BUILDERS OF
SINGLE AND MULTIPLE SPINDLE MACHINES
FOR BORING, DRILLING, REAMING,
TAPPING, ETC.—TWIN RAM HYDRAULIC
UNITS—MATCH-IT GEAR CHUCKS

LEMAIRE TOOL & MFG. CO. • 2663 S. TELEGRAPH ROAD • DEARBORN, MICHIGAN

YOUNG MAN—Is This YOUR *Postwar Opportunity?*

If you are one of the younger men who have definite ideas about making some phase of the machine designing and building business your life work, the opportunity you are looking for may be within the Snyder organization.

We design and build machines for a wide variety of operations. These are mostly special-purpose machines and frequently involve complex operations or multiple operations which present interesting and challenging problems in design, construction and tooling.

The variety of these problems and the scope of our business in general provides an exceptional opportunity to increase your knowledge and experience while working with the men under whose guidance this company has achieved its position among the leaders in this field.

Undoubtedly you are aware that the special-purpose machine will play an even greater role in postwar than in prewar days and in preparation for these postwar developments we are contemplating the necessary additions to our engineering, drafting and manufacturing staffs. We will select these men carefully and they will receive a thorough course of training under some of the country's best engineers and shop men.

If this opportunity appeals to you, we invite you to write to our Personnel Manager, outlining your experience and ability and indicating your ideas and aspirations in regard to your life work. Your letter will be held in strict confidence, of course.

Clarence Snyder

PRESIDENT

SNYDER TOOL AND ENGINEERING COMPANY

3400 East Lafayette • Detroit 7, Michigan

SNYDER

DESIGNERS AND BUILDERS OF SPECIAL-PURPOSE MACHINES FOR HIGH PRODUCTION AT LOW UNIT COST

20 Years of Successful Co-operation with Leading American Industries

(Continued from page 122)

manufacturers of high pressure die casting machines for zinc, aluminum and alloys. Also included in the bargain is the manufacturer's improved line of plastic injection molding machines.

* *

Award: Delta Manufacturing Company steps up for a bow. The firm has been notified of second renewal of its Army-Navy "E" award for "continued excellence in production of machine tools". The original award was made January 15, 1943 and renewed some months later. In commemoration, Delta has published a booklet for distribution to employees.

* *

Microcut: Use of a new trade name—"Microcut"—is announced by Quaker Chemical Products Corporation. The title will cover its line of soluble cutting oil bases.

* *

Excellent: Wales-Strippit Corporation is a recent winner of the Army-Navy "E" pennant. George F. Wales, President, invited friends of the company to be present at the ceremonies. The firm builds hole punching and notching equipment.

* *

Foreign: Meehanite Metal Corporation has contracted to make Meehanite castings for the Jay Engineering Works Ltd., Parganas, India. The foreign firm manufactures machine tools, household appliances, paints and varnishes. Announcement was made through the Meehanite London office.

* *

Distributor: Carboloy Company, Inc. announces through K. R. Beardslee, Vice President in charge of Sales, appointment of Garrett Supply Company as Southern California-Arizona distributor of Carboloy carbide and carbide cemented cutting tools. The move will supplement operations of the Carboloy Los Angeles Branch Office. Garrett proposes to conduct a training course for key men similar to that inaugurated by Carboloy in Detroit. This will be the first time a Carboloy distributorship has engaged in such a training program.

* *

Gages: Warren Industries announces addition of precision gages to their lines. The firm manufactures special cutting tools and special grinding equipment. Spline gages and indexing fixtures will be included in the new line, as well as the usual gages.

* *

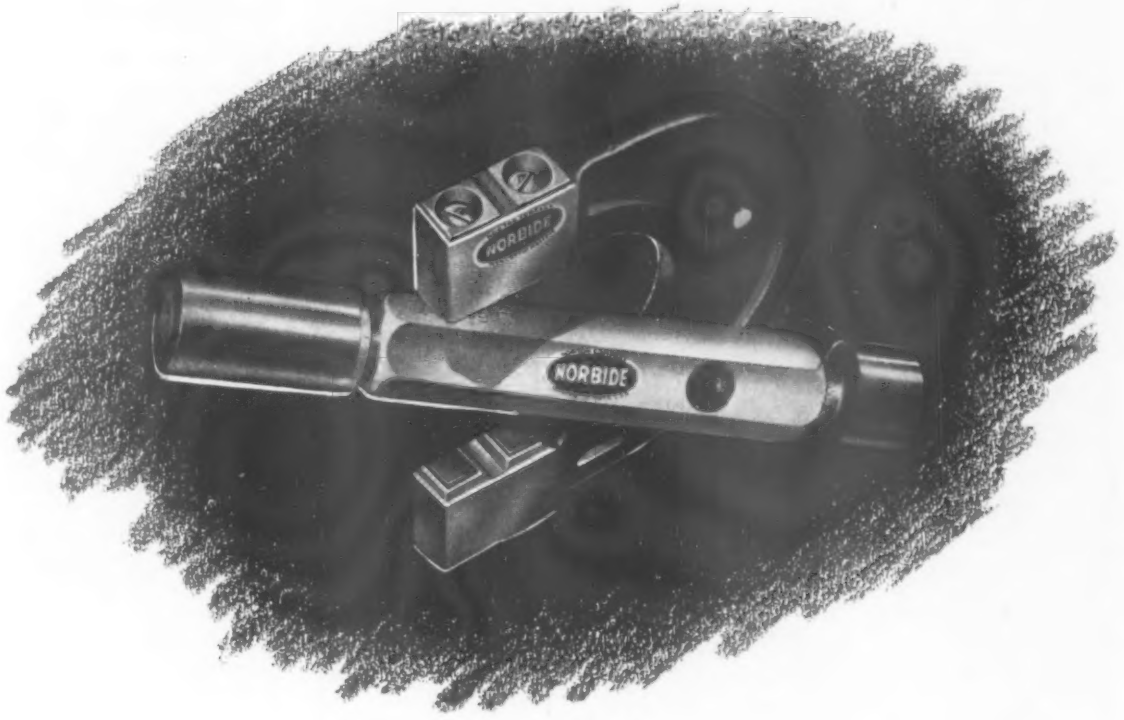
Hyster: Phillips Mine and Mill Supply Company has been named sales representatives for Hyster Lift Truck Company. Besides lift trucks, Hyster builds straddle trucks and "Karry Kranes".

* *

Honored: Admiral H. L. Vickery of the U. S. Maritime Commission, has announced official honors for Jenkins Bros. for the fourth time. Bernard J. Lee, Vice President, has been notified the firm has been awarded a third additional gold star for its "M" pennant originally awarded in 1943. The firm manufactures valves.

(Continued on page 132)

NORBIDE* Gages Last Longer



NORBIDE Gages last longer — 100 times and more — than conventional types of measuring devices. For NORBIDE (Norton Boron Carbide) is the hardest material made by man and, therefore, it possesses great resistance to wear. Furthermore, NORBIDE gage members will not pick up lint nor become charged with particles of metal.

Norton Company supplies NORBIDE gage blanks to gage manufacturers and to concerns making their own gages. Ask your regular gage manufacturer for NORBIDE gages and prove to yourself how the hardest material made by man increases gage life 100 times and more.

Or if you wish additional information write to Norton Company and for interesting information on NORBIDE gages request booklet No. 1100.

NORTON COMPANY — Worcester 6, Mass.

Hardest Material Made by Man

11 MORE HOLES . . . AND 18 MORE PIECES *per hour!*

W. F. & John Barnes unit-type machine equipped with four heads. The two rear heads do not show in this picture.

Manually-operated double deck holding fixture.

Tank track links—(left) rough link ready for machining—(right) finished link showing all holes drilled.

★ *Unit-Type Machine Replaces Two Machines . . . Saves Manpower*

Here is a unit-type machine which produces more holes and more pieces per hour than previously produced by four machines and four operators. Former machining method required two drilling and two reaming machines to produce tank track links. Twenty-two of these parts were produced per hour. Now a four-unit W. F. & John Barnes machine is used to do all drilling operations, including 11 holes which formerly required a single purpose drill. Reaming is still done on the same machines. Changeover to a W. F. & John Barnes unit-type machine resulted in a production increase from 22 pieces to 40 pieces per hour. This time includes all drilling and reaming. Additional savings were made, for two machines were replaced and one operator was released for other work.

Analyze Your Present Machining Methods

You may be able to make even greater savings in time and manpower by tooling your work on unit-type machines. Constructed from standard hydraulic feed and drive units, these machines are adaptable to all types of work. Further, the units can be easily rearranged to take care of change in part design. When it is necessary to convert your equipment to peace-time production, the flexibility of unit construction makes it possible to retool faster, easier and with less expense.

Consulting Our Engineers Creates No Obligation

They will be glad to make recommendations regarding your production problems. Take advantage of their experience in designing and building special high production machine tools. It will result in a substantial savings for you.

PART TOOLING AND OPERATIONS

Part—Tank Track Link.
Machine—Four Head Unit-Type.
Number of Spindles—9-9-2-2.

Operations:
1. Drill 6 holes each side—top of fixture.
2. Drill 2 angular holes each side—drill 3 holes in channel section.

Machining Cycle:
1. Head on right side and two heads in back work simultaneously.
2. Left-hand head starts and completes cycle after others are retracted.

Drill Sizes:
L.H. — 11/32", 15/32"—17/32" 2(F), 23/64".
R.H. — Same.
L.H. — 2 — 9/16" angular holes.
R.H. — Same.
Previous Production—22 pieces per hour.
Present Production—40 pieces per hour.
Savings—1.22 minutes per piece.

OBTAIN THIS FREE INFORMATION NOW

These helpful bulletins show practical methods for solving many metal-working problems on W. F. & John Barnes Special and Unit-Type Machines. You will be interested in the information they contain. Write for Bulletin No. 1044.

W. F. & JOHN BARNES

W. F. and JOHN BARNES

325 SOUTH WATER STREET • ROCKFORD, ILLINOIS, U.S.A.

Give "Green Hands" Blue Flash Performance

Here's help for "newcomers" . . . cut-off wheels that compensate to the fullest possible extent for workers' undeveloped skill... wheels that cut clean, free and straight with minimum amount of burr and burn . . . wheels that weather rough treatment.

Train "green help" to recognize features that add finesse to the quality of their work. With Bay State resinoid-bonded, rough-sided cut-off wheels, they get freer cutting action, longer life. Discoloration and heat are minimized because contact surface area is noticeably reduced.

Bay State makes wheels for every type of cut-off machine... rubber-bonded wheels for wet operations, resinoid-bonded wheels for dry. Constant rigid laboratory inspection of raw materials . . . modern ovens with delicately-set temperature regulators... and other factory refinements contribute to the mounting reputation for leadership of Bay State "Blue Flash" cut-off wheels just as they do for Bay State's complete line including all types of grinding wheels and other molded abrasive products. Bay State's reputation for honing and superfinishing stones is unexcelled.

Test a wheel to see how Bay State quality helps "green hands" and veterans too. For additional details get Bay State's Cut-off Bulletin. Write...

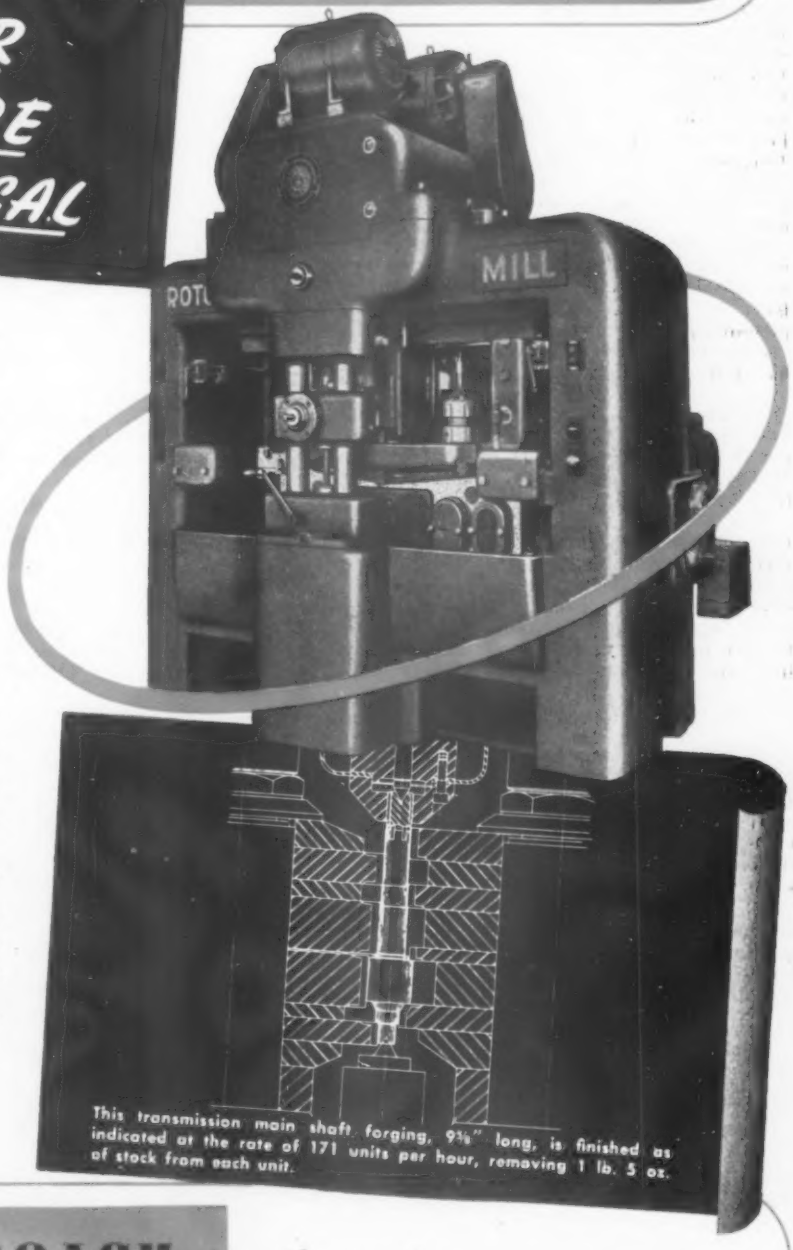
BAY STATE ABRASIVE PRODUCTS CO.
WESTBORO, MASS.

BLUE FLASH GRINDING WHEELS *FAST and COOL*

GRINDING WHEELS · HONING AND SUPERFINISHING STONES · PORTABLE SNAGGING WHEELS
MOUNTED WHEELS AND POINTS · CUT-OFF WHEELS · INSERTED-NUT DISCS AND CYLINDERS

Use the ROTOMILL
...INSTEAD OF THE LATHE

It's FASTER and MORE ECONOMICAL



This transmission main shaft forging, 9⅛" long, is finished as indicated at the rate of 171 units per hour, removing 1 lb. 5 oz. of stock from each unit.

Machining cylindrical, conical or flanged work such as gear blanks, shafts, steering knuckles, etc. can be done more effectively on the RotoMill than it can on the lathe. A tolerance of .004" in diameter is normally maintained thus eliminating in many cases a final finishing cut.

Metallurgical changes in the surface metal of the work part due to cold working do not occur because there is very little rise in temperature during the cutting operation. For the same reason cutter life is surprisingly long.

A cutter change, when cutters are kept in sets mounted on solid arbors, can be made in about fifteen minutes. Thus the RotoMill is just as effective on short runs as it is on long production jobs.

WRITE
FOR DESCRIPTIVE BULLETIN

NATIONAL BROACH AND MACHINE CO.

RED RING PRODUCTS

3600 ST. JEAN • DETROIT 13, MICH.

Specialists on SPUR AND HELICAL INVOLUTE GEAR PRACTICE

Originators of ROTARY SHAVING AND ELLIPTOID TOOTH FORMS

(Continued from page 126)

MOTOR MEMOS

No questions barred as General Motors executives discuss reconversion problems. Industry gets green light on planning.

GM Earmarks $500,000,000 for Modernization, Expansion

DETROIT—Late last month General Motors held a press conference in which it presented the case for "Combined Operations". The facts revealed by the Corporation on how and why combined civilian and war production can be undertaken between the end of the European conflict and the defeat of Japan, might have been presented by any one of the major automobile producers.

In short, these production wizards stated that if limited automobile output were to begin within 90 days of the collapse of Germany, definite work on planning production and tooling must commence at least 90 days before Hitler's fall.

With complete disregard for "business secrets," the GM President and all his Vice Presidents and Operating Managers answered every question fired by a corps of newsmen.

The result was a clearing of fog from GM postwar plans, as well as the actual reconversion problems facing every auto producer. Biggest news announced by GM is the fact that it is prepared to spend up to $500,000,000 on the job of total reconversion. An initial expenditure of $25,000,000 already has been earmarked to cover orders already placed for critical machine tools.

Full reconversion may require as much as $75,000,000, said likable soft-spoken Charles E. Wilson, GM President. The remaining $425,000,000 is ready to cover the costs of the huge expansion program the Corporation expects to undertake after the war. Such money will be used for modernization of present plants and machinery.

Held on the eve of the Auto Industry-War Manpower Commission meeting out of which came approval for limited use of men and materials in planning product improvement, plant layout and material requirements, the GM men explained the pressing need for completing such work before widespread war contract cancellations throw thousands out of work.

With a scant thousand skilled workers, not needed on war production at present, devoting full time to these tasks for two or three months, Wilson explained, reconversion unemployment would be cut by weeks.

But the biggest problem is securing a few critical machine tools, without 100 per cent of which even the most limited auto output cannot be undertaken. To date, General Motors has placed orders for all such machines needed to restore its plants to 50 per cent of their 1941 capacity.

Satisfactory delivery dates have not been promised on any machine, Wilson said. Some builders have been unable to indicate any delivery date.

Some machines are needed by every Division of the Corporation. Buick, for example, needs 310 machines before it can make a single car. Oldsmobile, which lost some of its machines to Australia, needs 352 units. Cadillac must get 221 machines. Chevrolet, although it can build trucks, is in need of hundreds of machine tools.

Before the war the Corporation used approximately 75,000 machine tool items, and accepted delivery on as many as 3,000 units a month. During the war about five per cent of those units were lost in the industry pool. Most of the 3,750 missing machines must be replaced before auto manufacture can be undertaken.

When will the first cars be built? All arm chair productioneering aside, the answer is simply not until after machine tool builders are able to deliver the last of these critical machines.

In discussing the postwar automobile General Motors men predicted that it would sell for "at least 20 per cent more". Queried by an editor of this magazine as to whether the technological and production lessons learned in war might not lead the way to lowered postwar manufacturing costs, Harlow Curtice of Buick answered, "I don't believe the methods developed in war production will bring about a counter effect on postwar car prices." Most of the really new things developed during the war, he believes, lie in the field of metallurgy, and few of those developments, when applied to auto manufacture, would have the effect of lowering cost.

In the final analysis, Curtice said soaring labor and material costs can be compensated for in part only through ingenious production planning after cars begin to roll from the line.

THE END

500-TON PRESS CONVERTED TO RIVETING JOB

DEARBORN, MICH.—**A new technique in aircraft parts fabrication, described as revolutionary by Ford Motor engineers, has been introduced in the old plastics division of the auto builder's Rouge plant.**

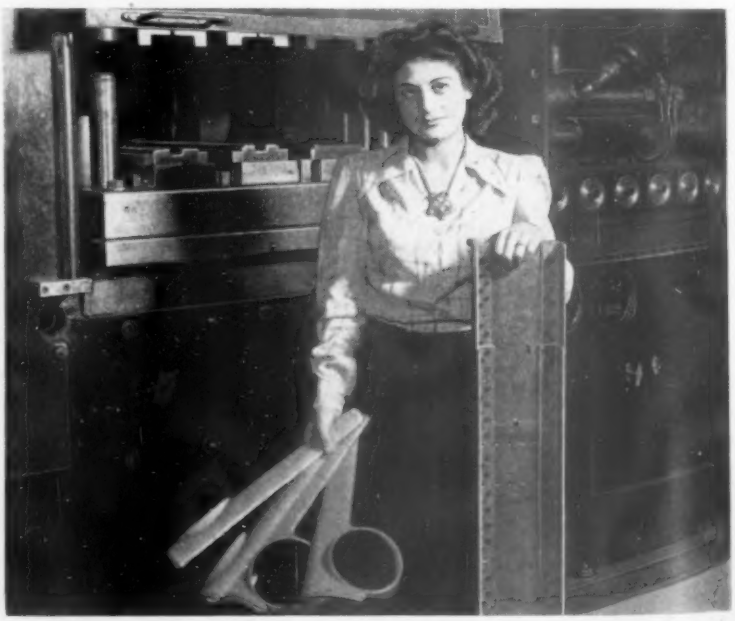
Eliminating hours of tedious hand riveting, a 500-ton H. P. M. fast traverse press is now being used to rivet fin bulkhead spars for B-24 Liberator bombers. In a single operation, two spars are completed and 270 rivets are driven.

Total time consumed by the press for placing the rivets, riveting and tacking, is 10 minutes, or five minutes for each spar. Hand riveting requires 25 minutes per spar.

Hand riveting has not been completely satisfactory because it results in warpage and uneven sheer strength. Press riveting, however, has greatly improved sheer strength characteristics in addition to eliminating all warpage, according to the automobile production men.

Additional dies are now being constructed for other presses at the Rouge plant, so that other bomber parts can be riveted by this method. Such operations have made it possible for Willow Run, world's largest bomber plant, to exceed its production quotas for the last 11 months, turn out a plane an hour.

Before the war, the H. P. M. presses used in this work were tooled for producing plastic auto parts such as instrument panel bezels.



Eliminating hand riveting, this 500-ton H.P.M. fast traverse press is used by Ford to rivet aircraft fin bulkheads. The press completes two spars and drives 270 rivets in one operation. The worker is holding one of the bomber spars and the prewar product of the press, plastic auto parts. Ford Motor photo

TOCCO ANNOUNCES

Two Major Developments in Induction Heating

NEW THE WATER-COOLED MOTOR GENERATOR

A radically new development now used in the larger TOCCO machines. Circulated water replaces forced air ventilation as a cooling medium for the motor-generator, affording TOCCO these revolutionary advantages:

TOTALLY ENCLOSED. Motor generator is hermetically-sealed against dust, dirt and grit. Minimizes wear and maintenance.

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Sets a new high standard in radio-frequency induction heating. A 20 K.W. unit for hardening, brazing, annealing or heating small parts . . . for hardening sharp contours such as cutting edges . . . for shallow surface-hardening. Advantages:

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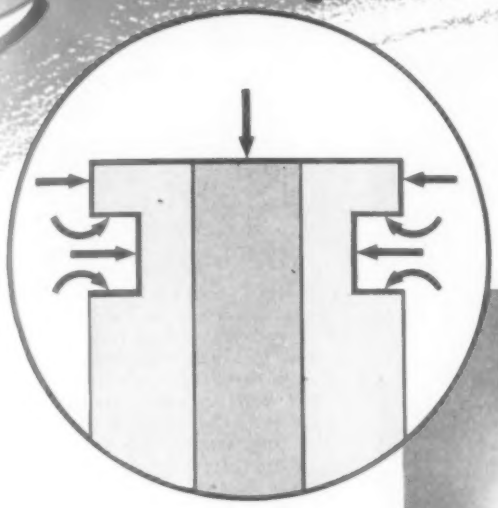

The drawing above shows the broached contour of the part in the photograph at the right. These nine surfaces are cut in one pass on a horizontal broaching machine. No other machining process can duplicate this performance.

MEMBER BROACHING TOOL INSTITUTE

DETROIT BROACH COMPANY designed and built tools and fixtures for broaching the automatic pistol frame shown above. The operation had formerly required six milling machines and six operators plus the extra handling. Broaching requires only one machine and one operator thus providing greatly increased production per man and machine hour. Accuracy is improved considerably and production costs are much lower. ¶ There are many places in every shop where a change to broaching will increase efficiency. Broaching provides the advantages of great accuracy, high production speed and low cost due to extremely long tool life. Look over your own production processes and note where broaching might help you. Then call Detroit Broach Company. Our competent broach engineers will furnish you with complete cost and production data for your particular requirements. You will not be obligated, of course.

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PRODUCTION ROUND TABLE

(Continued from page 102)

it today, "he continued, "it wears out even faster".

Industries in such a position, he reasoned, would go into the DPC market to pick up whatever good equipment they could find to prepare for postwar production. Machines required but not available among Government surpluses will, he added, be ordered immediately from the machine tool builders.

POSTWAR IMPROVEMENTS SUGGESTED

3. Are changes in machine tools indicated to fully utilize improvements in cutting tools?

Poll results: 65.76 per cent "yes"; 34.24 per cent "no".

All five Round-Table conferees voted "yes" on this query.

Drawing upon his experience in maintaining a very large battery of screw machines, Adams said he believed that machine tool builders would really be busy after the war if they revised their designs to regain ground lost during recent advancements in cutting tools.

"Some screw machines, and a few of the most popular single spindle machines, have enjoyed very little change or improvement in recent years," he said. "Some of the multiples have been strengthened to take the new tool steels and alloys. I believe an industry-wide effort to improve machines after the war would substantially increase the new machine tool market".

Tabb said, "Definitely yes. There isn't an automatic machine that I haven't had to reinforce to get the rigidity necessary for using carbides."

Speaking on postwar machine tool designs, Tabb said he foresees a trend toward high production, single purpose machines. "Even now," he said, "If we can't buy them, we make them."

While Moore sees a need to change machine tool design to utilize the full potential of today's cutting tools, he thinks much improvement will be made automatically after the war because of the trend toward designing special single purpose machines. As the builders create these models to meet special requirements, he explained, improvements will be made.

RACE BETWEEN MACHINES AND TOOLS

On this subject Tabb complained that some machine tool builders, when asked to produce special equipment, try to incorporate into their design certain features that will make the basic unit marketable elsewhere. "Consequently," he explained, "you get tonnage in the machine that is unnecessary. Then we are forced to put our own engineers to work to build our own single purpose machines."

"A number of machine tool people have told me," Gray said, "that as soon as the war rush is over, they are set to turn out stronger, faster machines. When the market begins to fall they will give us something better."

Grutsch said that in the last 20 years he has witnessed a continual race between machines and tools. "First, tools are improved, then gradual improvement in machines finally catches

(Continued on page 138)

PRODUCTION ROUND-TABLE

(Continued from page 136)

up with the tool design. I would not say that every machine tool on the market today is outmoded, but I think a good many of them are," he explained. "I don't know of any great improvement in grinder wheels in the last three or four years that would cause you to ask for more rigidity or strength or speed in grinding machines. Turret lathes and milling machine, however, I would say definitely could be improved."

CALL FOR IMPROVEMENTS IN CONTROLS

4. As a general rule, should machinery controls be changed so as to provide greater motion economy on the part of the operators?

Production Poll vote: 84.89 per cent "yes"; 15.11 per cent "no".

The Cleveland production men voted 100 per cent for improvements, but generally pointed out that the machine tool builders cannot be blamed entirely for the inadequacy of their products in this respect. War time Governmental restrictions, including freezing and simplification of models, accounts for much of the complaint about the excess expenditure of worker motion in controlling machines, Grutsch said.

Adams looks not only for improvement in controls, but the incorporation of hopper and slide feeds for many machines that will reduce numerous production jobs to single control operations.

"Yes," said Tabb, "because we have found it necessary to install hydraulic and electric controls on most of our machine tools to speed production by eliminating the need for operators handling so many levers."

5. Do you favor electronic controls? Production Poll results: 86.38 per cent "yes"; 13.62 per cent "no".

The Round-Table vote was unanimous for electronic controls.

While all of the participants predicted widespread utilization of electronic motor control, they also cited numerous other uses of electronics in their own production today. Tabb pointed to the use of electronics in inspection in Jack & Heintz plants, and Adams said he "looks for various gadgets that will be incorporated to protect machines and workpieces when tools break."

Tabb described an electronic installation in his plant which controls tool pressure. "When the tool gets dull," he explained, "the pressure goes up and eventually the automatic kicks out. Then the operator can replace the tool to maintain top efficiency.

LUBRICATION VOTED UNSATISFACTORY

6. Are lubrication systems on machine tools today efficient, adequate and accessible?

Industry-wide opinion: 40.44 per cent "yes"; 59.56 per cent "no".

A poll of Round-Table opinion resulted in a 100 per cent "no" answer.

Tabb said, "We have changed them on every machine tool we have."

In Grutsch's opinion "some of them are satisfactory, and some are not. I

(Concluded on page 140)

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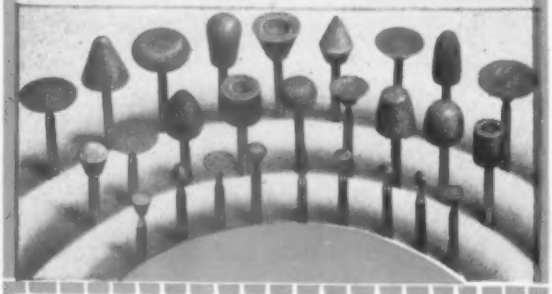

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PRODUCTION ROUND-TABLE

(Concluded from page 138)

think," he continued, "when they get the lubrication of a machine tool down as well as it is in automobile engines, everything will be satisfactory."

The Cleveland Tractor engineer also charged builders with putting oil cups where they cannot be conveniently reached.

7. Do you see a trend toward a reduction in stock removal for finish by such means as precision forming, casting, forging, stretching, etc.?

Production Poll answer: 77.19 per cent "yes"; 22.81 per cent "no".

All of the Cleveland Round-Table conferees voted "yes" on certain types of production.

"I believe there will be a lot more precision casting," said Adams. "On some jobs tolerances of .0005" are being held, and this eliminates a lot of machining. This is also true of a lot of screw machine jobs, since it cuts down the amount of material that must be turned off and permits the use of shaving tools."

"I can see a trend to centrifugal castings after the war," Tabb said. "We have 10 jobs on centrifugal castings running now."

Greater precision in forgings and castings is today reducing the amount of machining necessary, Moore said.

LIGHTING PLANNED FOR MAINTENANCE

● Cleaning and relamping high bay lighting fixtures is quickly and safely done through use of a trolley system installed in the Westinghouse East Pittsburgh plant. The system is applicable in most shops.

The fixtures are hung from trolleys that ride on inclined steel cables which are suspended between the wall of the building and the vertical center support of the roof truss. For washing and relamping, the entire assembly is pulled to the cat-walk running lengthwise of the building.

The cable is inclined to insure return of the fixture to the correct location, where a cable clamp is placed.

"We have noticed a great improvement in the last three years in both castings and forgings for the same parts."

Gray predicted "a trend toward more stampings in place of castings." "In our own case," he said, "the use of stampings in place of certain castings is cutting down on stock removal."

While Grutsch fails to see much chance of greater precision in heavy castings after the war, he does think "you are going to get much better precision with permanent mold castings in aluminum, bronze and brass."

"Before the war," he explained, "we got permanent mold brass castings within .0003" tolerances, but when you get into heavy castings for big engines and Diesels I don't think there will be any less stock removal required after the war." THE END

FITCHBURG GRINDS ACCURATE TO .000025"

CONTINENTAL MACHINES
Incorporated
1301 WASHINGTON AVENUE SOUTH
MINNEAPOLIS

October 8, 1943

The National Machine Tool & Supply Co.
Att: Mr. C. O. Hanson
13 No. 1
Minneapolis, Minnesota

Dear Mr. Hanson:

I believe you will be interested in a job which we performed on the Fitchburg Grinder recently purchased from you.

The job consisted of grinding the O.D. of a piece of hollow tubing 1-1/2" in diameter and approximately 4" long. This part is used as a master squaring gage, and the grinding had to be held to extremely close tolerance of accuracy. Several attempts were made to grind the part by conventional holding methods, but it was found that upon releasing the work from the arbor it would distort beyond the limits to which the part had to be held. We finally devised a method of holding the tubing during the grinding operation, and using the Fitchburg Grinder we were able to grind 100 of these parts to an accuracy of 25 millionths maximum taper over the 4" length, and within 25 millionths of concentricity.

Needless to say, we are very well pleased with our Fitchburg Grinder when we can use it to grind down to millionths in accuracy.

Yours very truly,

CONTINENTAL MACHINES, Inc.

Vice President

JWWilkie.cm

Unsolicited letter received by Fitchburg regarding type "C" Grinder

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A.S.T.E MEETS AT SYRACUSE

(Concluded from page 106)

Afternoon session will be titled "Tool Engineering Education" under direction of O. W. Winter. Dr. Mark Ellingson, President, Rochester Institute of Technology, Rochester, N. Y., will discuss "Education for Reality". He will develop the thesis that a revolution in higher education is resulting from failure of liberal arts colleges to include sciences in curricula.

Following Dr. Ellingson will be William F. Patterson, Apprentice Training Service, War Manpower Commission, Washington, D. C. He will speak on "Only Apprenticeship Builds Craftsmen". His arguments will be based on experiences gained since 1937 when Congress authorized the Apprentice-Training Service.

TRAINING NEW TOOL ENGINEERS

Final paper in the session will be "Apprenticeship Training for Future Tool Engineers". It will be presented by L. J. Fletcher, Director of Training, Caterpillar Tractor Company, Peoria, Ill.

A departure from previous meetings, the banquet session will be limited to 650 persons, all members of A. S. T. E. This rule resulted from limited facilities and an acute shortage of service personnel.

The banquet will open at 6:30 p. m. with a reception. Chairman will be D. D. Burnside, A. S. T. E. National President. J. A. Siegel, the Society's first president is billed as toastmaster and W. B. Peirce, Third Vice President A. S. T. E. will be host.

Banquet speaker will be James Y. Scott, President, Van Norman Company, Springfield, Mass. and President, National Machine Tool Builders Association, Cleveland. His topic will be "Engineering for Peace".

Preliminary word to Miss Doris B. Pratt, Chapters Service Department, indicates that all chapters will be represented by at least two delegates, qualified to take back to their chapters informative reports on symposium data. Attendance is expected to be high despite travel difficulties.

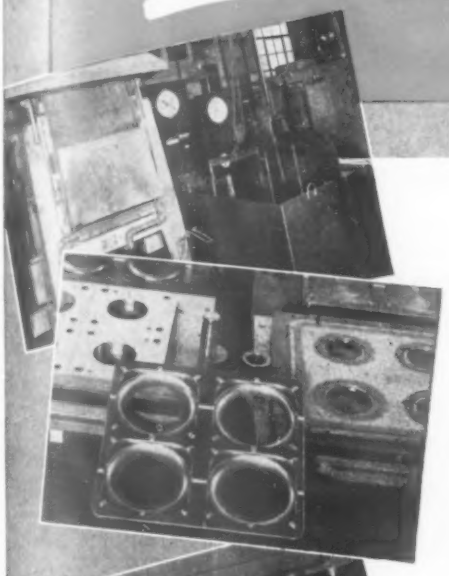
PLANTS TO WELCOME DELEGATES

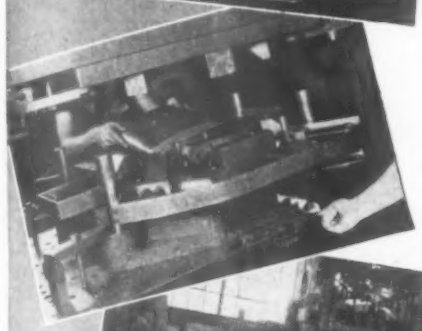
Following is a tentative list of plants to be included in the visitation program: Doyle Machine Company, aircraft parts; Carrier Corporation, air conditioning; Lipe-Rollway Corporation, clutches; Brown-Lipe-Chapin Company, bearings; Roll-way Bearing Company, roller bearings; Lamson Corporation, conveyers; Crouse Hinds Company, electrical fittings; Aircooled Motors Corporation, aircraft engines, New Process Gear Corporation, gears; Easy Washing Machine Corporation, aircraft generators; L. C. Smith & Corona Typewriters, Inc., typewriters; Kilian Manufacturing Corporation, pressing machines; U. S. Hoffman Machine Company, shells, and General Electric Company, radio.

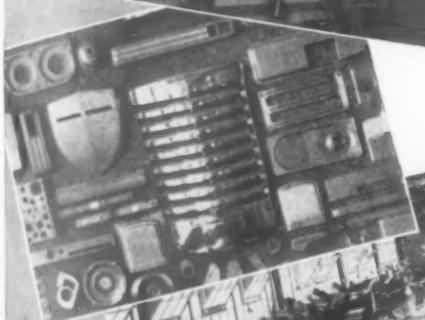
This list is subject to change through reason of security and war demands.

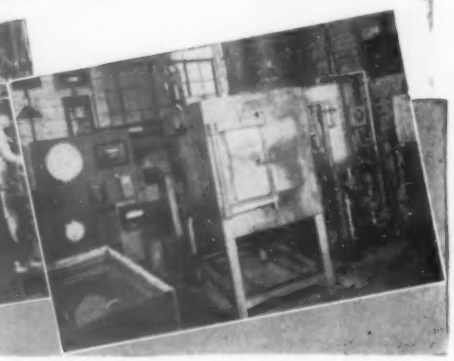
More A. S. T. E. members have been drawn for the speaker's panel than at any previous meeting, convention officials report. More than a quarter of the papers presented will be by members of the society. THE END

Exact KNOWLEDGE









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THIS ONE covers in more detail the repair of broken cutting tools by low-temperature EASY-FLO brazing, and describes and illustrates the application of the process to band and circular saws, drills and taps, broaches, milling cutters and various other production tools.

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INDUSTRY POLL POINTS TO PLAN-O-MILL!

Here's how PLAN-O-MILL *measures up to Industry's demand*

The Bramson Publishing Company's
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• Staff editors of this publication believe the answers to these questions may guide readers toward an enlightened outlook on postwar mass production. Answers gathered from the field, from the more than 20,000 readers of this magazine and at its PRODUCTION Round Tables each month, will undoubtedly reflect the thinking of the metal-working industry in the U. S. and Canada.

QUESTION	Per Cent Replying YES	NO
1. Do you envision greater precision in postwar manufacturing?	50%	50%
2. Where advisable, will you replace pre-war equipment with war-built or D P C equipment?	70%	30%
3. Are changes in machine tools indicated to fully utilize improvements in cutting tools?	100%	—
4. As a general rule, should machinery controls be changed so as to provide greater motion economy on the part of operators?	100%	—
5. Do you favor electronic controls?	93%	7%
6. Are lubrication systems on machine tools today efficient, adequate and accessible?	3%	97%
7. Do you see a trend toward a reduction in stock removal for finish, by such means as precision forming, casting, forging, stretching etc.?	94%	6%

inadequate. The ... of color ... PRODUCTION Round Table poi...

July 1944—*Tool Engineer.*

1 Plan-O-Mill does a precision job at a production rate.

3 Plan-O-Mill is up to the minute in efficient use of cutting tools, either high speed steel or carbide.

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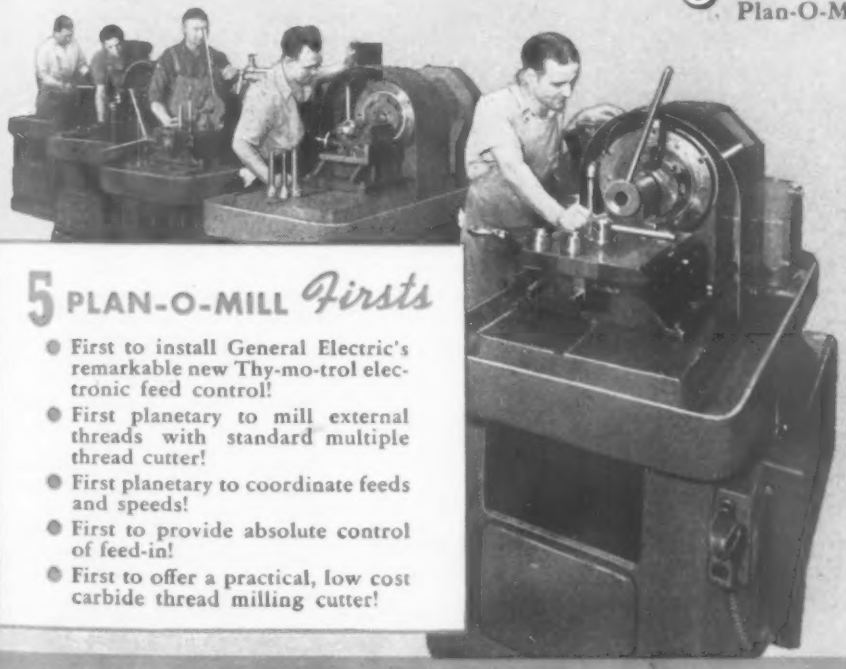

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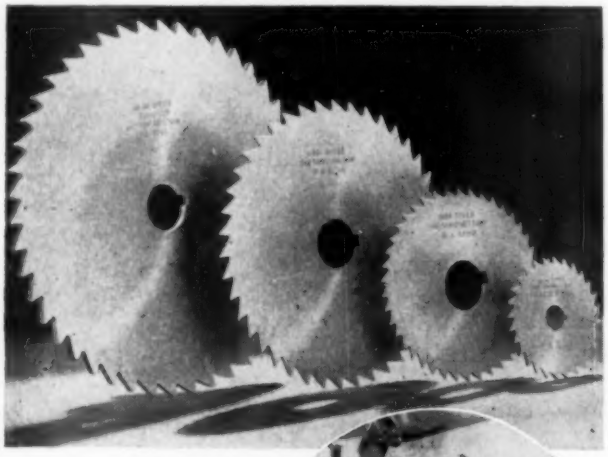
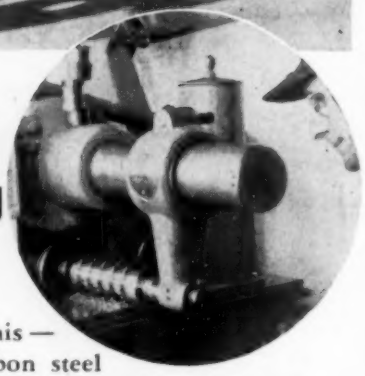
For Gang-Milling Jobs up to 150 Saws per Set-up





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Carbide Tipped Cutters

ARMIDE is a sintered-carbide cutting material which approaches the diamond in hardness. **ARMIDE** will machine the hardest and toughest steels and sand-filled castings with ease, as well as such heretofore "unmachineable" substances as hard rubber, plastics, and even glass. Because of the extreme hardness of **ARMIDE**, cutter bits tipped with this material will hold their cutting edge much longer than the finest tool steels and will machine from 10 to 100 times as many pieces between grindings.

ARMIDE-tipped **CUTTERS** offer special advantages on machining operations involving: (1) Long runs, (2) Sand filled castings, (3) Tough alloy steels, (4) Machining of hardened parts without annealing and subsequent re-hardening, as in maintenance work, (5) High Speed Machining, (6) Machining of unusual materials.

ARMIDE Carbide Tipped Cutters are designed for use in **ARMSTRONG** Carbide **TOOL HOLDERS**. They come in two grades **ARMIDE** (Red) for machining steel, and **ARMIDE** (Grey) for machining cast iron, brass, bronze, aluminum and non-metallics. These grades of **ARMIDE** are distinguished by the corresponding color of the cutter-bit shank.

Both **ARMIDE** (Red) and **ARMIDE** (Grey) Cutter-Bits come ready-ground in four standard cutter shapes (illustrated below) namely: Right-Hand Turning, Left-Hand Turning, Square Nose Finishing 80° and Round point "V". Both **ARMIDE** (Red) and **ARMIDE** (Grey) cutter-bits come with either "Square" or "Heavy Duty" shanks. The shanks of "Square" cutters have a square cross section. The shanks of "Heavy Duty" cutters are deeper than they are wide in cross section, the added depth compensating for that part of the shank cut away to receive the **ARMIDE** tip.


Square L.H. R.H. 80°

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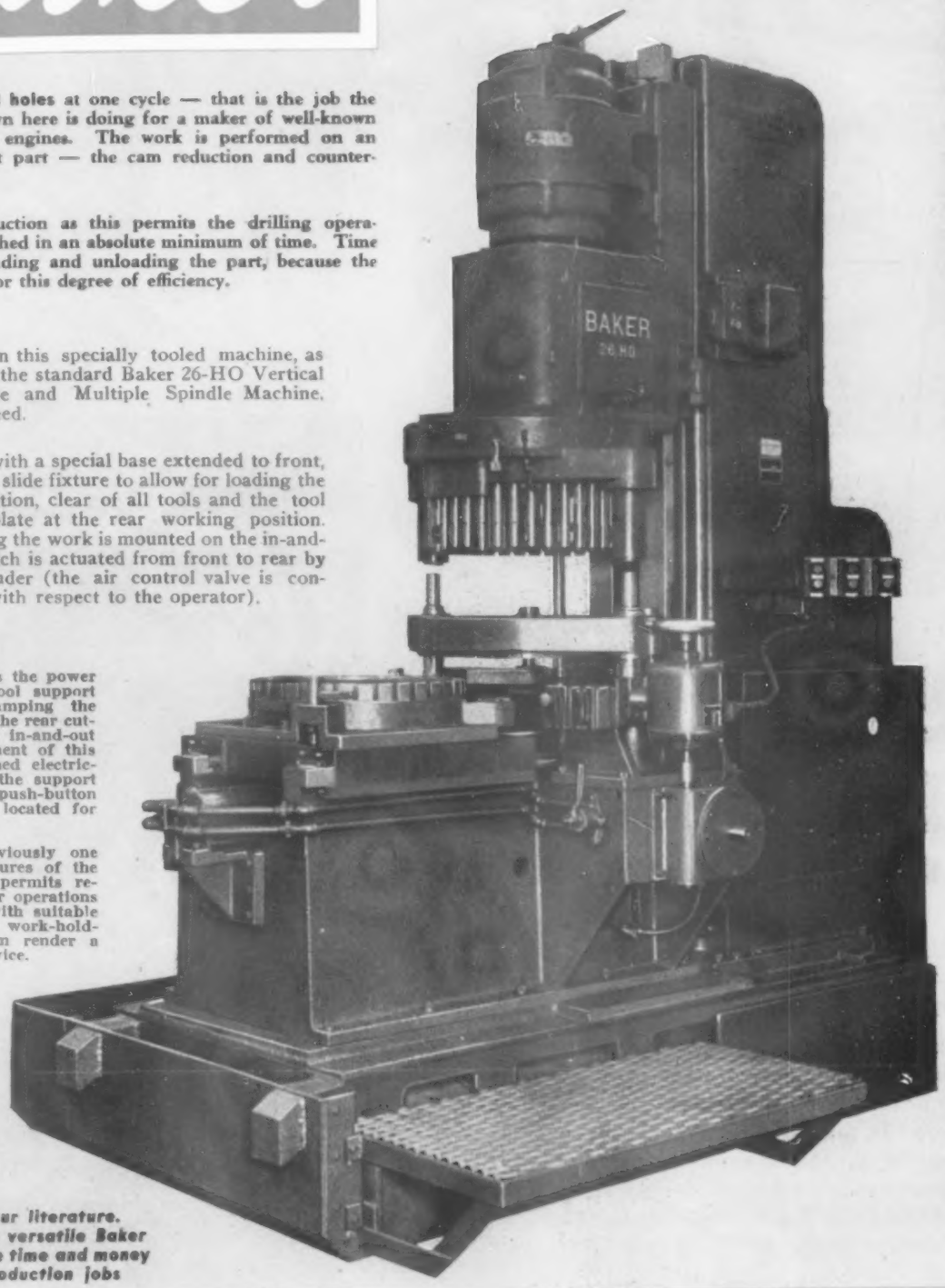
Baker

HEAVY-DUTY VERTICAL HYDRAULIC FEED MACHINE

SINGLE AND MULTIPLE SPINDLE

Multiple drilling 38 holes at one cycle — that is the job the Baker machine shown here is doing for a maker of well-known radial-type aircraft engines. The work is performed on an extremely important part — the cam reduction and counterbalance support.

Such high production as this permits the drilling operation to be accomplished in an absolute minimum of time. Time is also saved in loading and unloading the part, because the machine is tooled for this degree of efficiency.



● The basic unit in this specially tooled machine, as illustrated here, is the standard Baker 26-HO Vertical Heavy-Duty Single and Multiple Spindle Machine, with Hydraulic Feed.

● It is furnished with a special base extended to front, with an in-and-out slide fixture to allow for loading the work at front position, clear of all tools and the tool support bushing plate at the rear working position. Fixture for locating the work is mounted on the in-and-out slide table which is actuated from front to rear by means of air cylinder (the air control valve is conveniently placed with respect to the operator).

●Another feature is the power movement of the tool support bushing plate, clamping the work when it is in the rear cutting station on the in-and-out slide table. Movement of this plate is accomplished electrically by means of the support motor, as shown; push-button station is handily located for the operator.

●Flexibility is obviously one of the notable features of the Baker 26-HO. It permits retool for many other operations —when equipped with suitable multiple head and work-holding fixtures, it can render a broad range of service.

ARMY E NAVY

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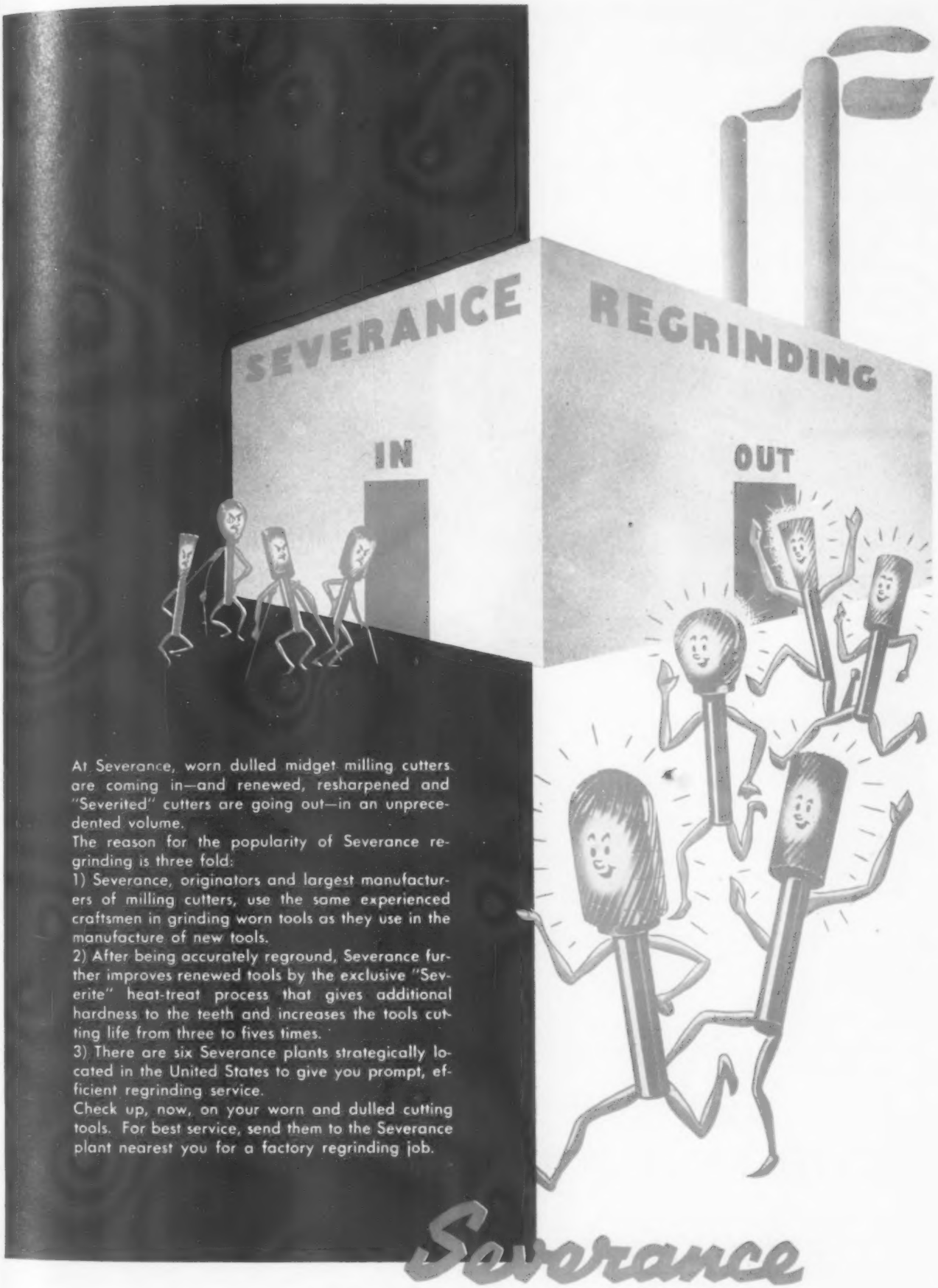
Baker Brothers, Inc. Toledo, 10, Ohio

MACHINES FOR DRILLING • BORING • TAPPING • CONTOUR GRINDING



At Severance, worn dulled midget milling cutters are coming in—and renewed, resharpened and "Severited" cutters are going out—in an unprecedented volume.

The reason for the popularity of Severance regrinding is three fold:

1) Severance, originators and largest manufacturers of milling cutters, use the same experienced craftsmen in grinding worn tools as they use in the manufacture of new tools.

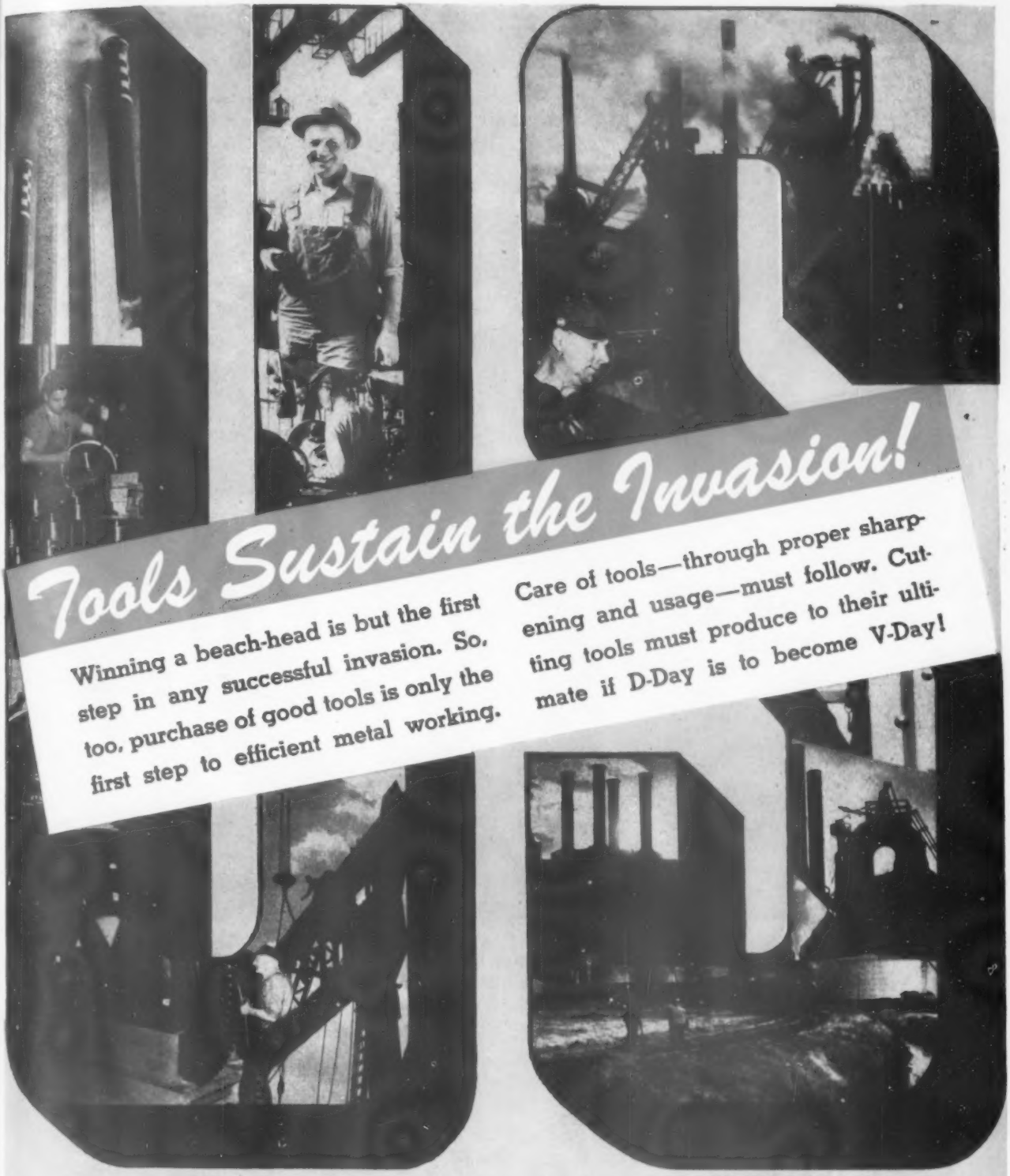
2) After being accurately reground, Severance further improves renewed tools by the exclusive "Severite" heat-treat process that gives additional hardness to the teeth and increases the tools cutting life from three to fives times.

3) There are six Severance plants strategically located in the United States to give you prompt, efficient regrinding service.

Check up, now, on your worn and dulled cutting tools. For best service, send them to the Severance plant nearest you for a factory regrinding job.

Severance

MIDGET MILLING CUTTERS • PRECISION REGRINDING • SEVERANCE TOOL INDUSTRIES INC., SAGINAW, MICH. • PLANTS IN LONG ISLAND CITY 1, N. Y.; DETROIT 2, MICH.; FORT WAYNE 8, IND.; CHICAGO 6, AND LOS ANGELES 21. IN CANADA: 60 FRONT ST., W., TORONTO, ONT.



Tools Sustain the Invasion!

Winning a beach-head is but the first step in any successful invasion. So, too, purchase of good tools is only the first step to efficient metal working. Care of tools—through proper sharpening and usage—must follow. Cutting tools must produce to their ultimate if D-Day is to become V-Day!

National cutting tools, sold by leading Mill Supply Distributors, are tools of character.

NATIONAL

NATIONAL TWIST DRILL & TOOL ROCHESTER, MICH., U.S.A.

TWIST DRILLS
REAMERS, HOBS
MILLING CUTTERS
COUNTERBORES
SPECIAL TOOLS

TWIST DRILL AND TOOL COMPANY

DETROIT AND ROCHESTER, MICHIGAN

Tap and Die Division—Winter Brothers Co., Wrentham, Mass.

Factory Branches • New York • Chicago • Cleveland • San Francisco • Distributors in Principal Cities

HOW TO SOLVE *Cutting Oil Problems*

YOU CAN, TOO!... Many operators measure cutting tool life by the number of pieces produced between grinds. This is misleading. It's only the *apparent* tool life.

Real tool life is measured by the number of pieces turned out before the tool is scrapped!

It depends not only on the number of grinds but also on the amount of metal removed each time. In selecting cutting oils, remember this difference.

With different oils, the APPARENT tool life may be identical—but a wide variance may exist in the TOTAL tool life!

Case histories on threading operations (as above) show as much as 12/1000 of an inch removed at each grinding. With S/V Sultran and S/V Vacsul Cutting Oils, the metal removed has been reduced to as little as 2/1000 of an inch.

The reason: S/V Sultran and S/V Vacsul Cutting Oils provide maximum lubricity to prevent excessive wear in the boundary areas. They also have high anti-weld properties to keep the built-up edge flowing with the chip, and high-pressure resistance to reduce tool wear in the extreme pressure areas.

GARGOYLE Lubricants

SOCONY-VACUUM

OIL COMPANY, INCORPORATED

Standard Oil of N. Y. Div.—White Star Div.—Lubrite Div.—White Eagle Div.—Wa[illegible] Div.—Magnolia Petroleum Co.—General Petroleum Corporation of C[illegible]

● In addition to making a complete line of standard die sets, we are especially well equipped to produce special die sets to your specifications. Send us your prints for prompt action—or call the "Detroit" man in your area.

DETROIT DIE SET CORPORATION
2895 W. GRAND BLVD. DETROIT 2, MICH.

★ **CALL "DETROIT"** ★

DETROIT	TR 2-5150
INDIANAPOLIS	LI 3884
MINNEAPOLIS	AT 5264
DAYTON	HE 3042
TOLEDO	GA 5706
SEATTLE	SE 2090
PORTLAND, Ore.	BR 0561
SAN FRANCISCO	MA 8532
BUFFALO	PA 9206
PHILADELPHIA	VIC 4084

DETROIT DIE SETS ★

left: A Campbell Abrasive Cutting Machine cutting aluminum bar stock on war production job.

below: A Campbell is used for precise job of cutting in plant of nationally-prominent manufacturer of bearings.

An important tube cutting job in an aircraft factory on the Pacific Coast.

Precision set-up on a manually-operated Campbell in a war production plant.

WHAT IS *YOUR* CUTTING JOB?

These 4 **CAMPBELL ABRASIVE CUTTING MACHINES** are all different. Each is cutting different stock to different dimensions—none limited to the job it is doing.

CAMPBELL has the only complete range of Abrasive Cutting Machines—cutting annealed and unannealed steels, non-ferrous alloys, plastics, glass and ceramics—solid bar, tubular and flat stock.

What are you cutting? **CAMPBELL** can give you a procedure that will do the work better, make it easier to meet schedules and lower costs.

Get further information by writing the Andrew C. Campbell Division. State what material you are cutting, length of pieces before cutting, length of cut-off pieces and production required per hour.

Campbell

ABRASIVE CUTTING MACHINES

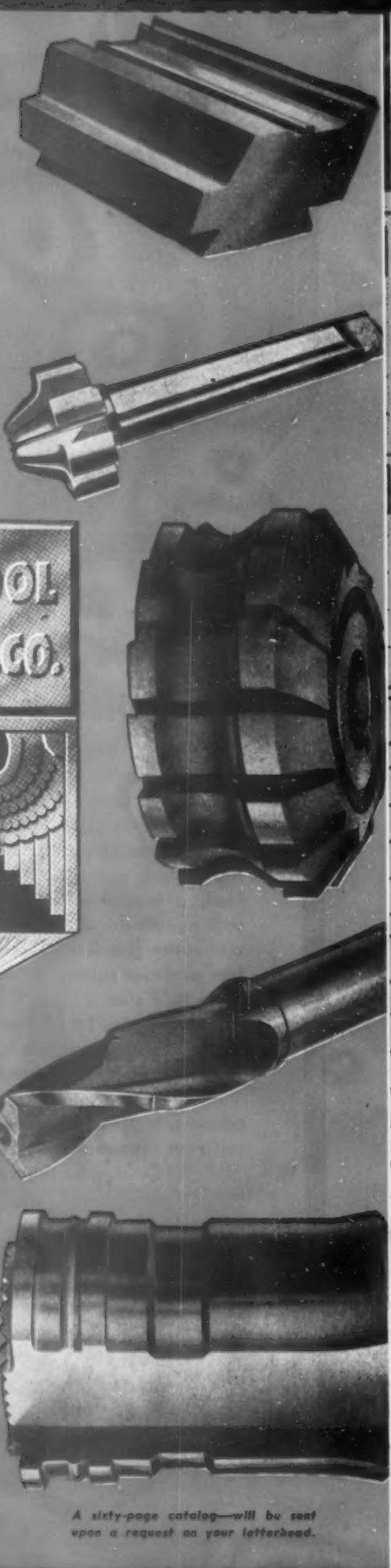
ANDREW C. CAMPBELL DIVISION
BRIDGEPORT • CONNECTICUT
ALSO MAKERS OF A COMPLETE LINE OF NIBBLING MACHINES

ACCO
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT • CONNECTICUT

A completely modern heat-treating department makes it practical for us to handle special high-speed steel assignments through every phase of their manufacture from engineering to shipping . . . single responsibility.

A section of our grinding room . . . in it is a seasoned skill of this more than fifteen-year-old oranization . . . and an experience of management that dates back to the very beginning of this kind of machining.

U.S.TOOL & MFG.CO.



A sixty-page catalog—will be sent upon a request on your letterhead.

U. S. TOOL & MFG. CO., 6906 Kingsley, Dearborn, Mich.

SECOMET
DIAMOND WHEELS

Resinoid-bonded **for grinding of carbide-tipped tools in large quantities, or on a production basis. Their extremely fast cutting action provides rapid stock removal. Also for fixed feed, precision grinding operations, such as cylindrical, surfacing, internal and cutter grinding, because of their free and cool cutting action and ability to hold size.**

Metal-bonded **for off-hand grinding, where the cutting surface is sometimes subjected to extreme abrading action.**

Made in all standard types and diameters, in diamond concentrations to suit your requirements.

Catalog on request.

J. K. SMIT & SONS

157 Chambers St., New York 7, N.Y. 6400 Tireman Ave., Detroit 4, Mich.

®

The outstanding performance of Logan Lathes in sustained accuracy and speed results from the exacting care that goes into every detail of construction. In the final inspection, a point-by-point check of the entire machine assures a completed assembly ready for production service. Of equal importance, all individual parts and all sub-assemblies are thoroughly tested as they are manufactured to prevent incorporation in the machine of any part not up to standard. The rigorous checking of parts, sub-assemblies, and the final inspection, strictly control the consistent accuracy and quality characteristics of Logan Lathes. Ask your nearby Logan Lathe dealer, or write for latest catalog describing all models of Logan Lathes.

Logan

LOGAN ENGINEERING CO.

CHICAGO 39, ILLINOIS

A NAME TO REMEMBER WHEN YOU THINK OF LATHES

CIRCLE "R"

METAL CUTTING SAWS

NO WONDER THEY'RE GOOD

This company has been making circular metal cutting saws since 1923, when it was founded, and all its officers and employees were experienced saw makers for a long time before that. Almost all of our factory space, 20,000 square feet, is devoted to this one product.

So it is a fair assumption that we "know" circular saws. In fact we *have* to, because our reputation depends chiefly on this one product. No wonder circle "R" saws are good!

Have you tried them? If not, send for our Catalog K.

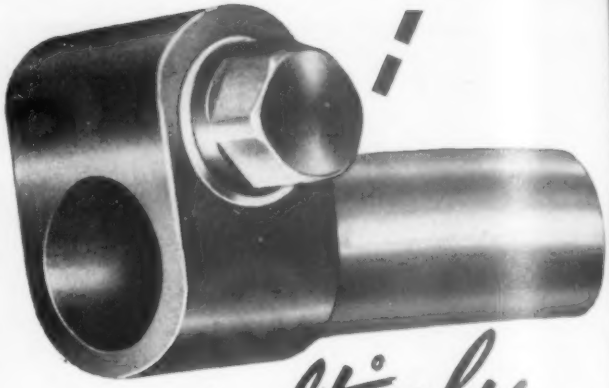
PRECISION CONTROL

of manufacturing is another reason why Circle "R" saws are good. Our modern heat treating ovens have potentiometric control, — the most accurate method for the purpose.

CIRCULAR TOOL CO., Inc.

PROVIDENCE 5, R. I.

NEW YORK · PHILADELPHIA · ROCHESTER
CHICAGO · DETROIT · CLEVELAND · DAYTON
INDIANAPOLIS · ST. LOUIS · LOS ANGELES



Multiply

THE CAPACITY OF

SCREW MACHINES WITH

BOYAR-SCHULTZ

MODEL H
PRECISION

ADAPTER

A PRECISION TOOL in every way, built to become a permanent part of screw machine equipment. It increases the flexibility of screw machines, making it possible to use more than one size tool on a single size machine.

With this Adapter, a Size 2 screw machine can accommodate Size 00 and Size 0 Tools. Size 00 Tools are readily used in Size 0 machines.

Made from the best obtainable alloy steel, it is hardened and ground to close tolerances to assure correct fit and will stand up under long, continuous service.

WRITE FOR
NEW CIRCULAR

BOYAR-SCHULTZ CORPORATION

2116 WALNUT ST. CHICAGO 12, ILLINOIS

LATROBE

Molybdenum

HIGH SPEED STEELS

for CUTTING TOOLS

Exacting metallurgical control and years of experience in the manufacture of Tool Steels make it possible for LATROBE to produce the highest quality in molybdenum high-speed steels. • Compare the analyses of these four steels and note the range in tungsten, molybdenum and vanadium content, thus affording the user the characteristics of toughness and abrasion resistance necessary to meet the requirements of varying metal-cutting problems.

Our service department will gladly help you on problems of heat treatment, selection or application. Write

LESCO

***EACH** of these steels assures you of Latrobe's distinctive qualities — superior heat-treating properties and longer tool life. Each is ideally adapted to its particular use.*

DOUBLE-SIX

C	Cr	W	Mo	V
.84	4.15	6.23	5.10	1.85

MATMO

C	Cr	W	Mo	V
.79	3.96	1.55	8.30	1.15

T.N.W.

C	Cr	W	Mo	V
88	3.90	—	8.00	1.90

HV-6

C	Cr	W	Mo	V
1.15	4.10	6.15	6.15	3.10

Latrobe ELECTRIC STEEL COMPANY

MAIN OFFICES *and* PLANT •• LATROBE • PENNSYLVANIA

Back of our Trade-mark

★ ★

NATIONAL Tools CLEVELAND

★ ★

Some of the Products of National Tool

HOBS, GROUND AND UNGROUND

★

REAMERS

★

COUNTERBORES

★

GEAR CUTTERS

★

MILLING CUTTERS

★

HERRINGBONE CUTTERS

★

GEAR SHAPER CUTTERS

★

SLITTING SAWS

★

SPECIAL TOOLS

★

BROACHES

★

CIRCULAR AND FLAT FORM TOOLS

National Tools are the shapers of progress.

Skill and Experience
of master planners,
engineers and workmen.
Finest Materials
to ensure
durable and dependable
metal cutting tools.
Super-sensitive Machinery
that has made
National Tool Products
famous for their

. . . Precision

Some of the Users of National Tools

Studebaker
Delco-Remy
Curtiss Wright
General Electric
Wright Aeronautical
Cincinnati Milling Machine
Thompson Products, Inc.
Jack & Heintz, Inc.
Warner & Swasey
General Motors
Nash-Kelvinator
International Harvester
Chicago Gear Works
Frigidaire
Delco Products
Ford Motor
Buick Motor
Packard Motor
Continental Motors
Chevrolet
Cadillac Motor
Chrysler
Pontiac Motor
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Heald Machine Company
American Locomotive
Caterpillar Tractor
R. G. LeTourneau, Inc.
Oliver Farm Equipment
Deere & Company
Ottumwa Iron Works
Youngstown Sheet & Tube
Sperry Gyroscope
Western Gear Works
Consolidated Vultee
S.K.F. Industries
Link Belt
Warner Gear
Spicer Manufacturing
D. O. James
Gleason Works
Detroit Gear Aircraft
Lufkin Foundry & Machine
Emsco Derrick & Equipment
Philadelphia Gear Works

Many other companies, large and small.

NATIONAL TOOLS HAVE AN INTERNATIONAL REPUTATION

ARMY E NAVY

NATIONAL TOOL Co.

11200 MADISON AVENUE . CLEVELAND, OHIO

NEW EQUIPMENT

• Materials + Processing •

BROACHING MACHINE WILL HANDLE 80% OF PARTS WORK (Q1)

Improvements to the broaching machine built by Zagar Tool, Inc., allow the equipment to handle 80% of all parts work. Plates accommodate broaches up to 1 ¼" in diameter, either key type, threaded type or grooved type. Cutting speed is variable.

WAR ORDERS UNCOVER NEW TRACTION DYNAMOMETER USES (Q2)

Numerous new applications of traction dynamometers have been discovered through impetus of war orders, according to W. C. Dillon & Company, Inc. Aircraft builders have found the instruments dependable in testing of odd sized pieces where conventional testers were ruled out.

Other uses reported include friction tests on hydraulic piston packings and in the steel industry for handling small bundles and odd lots of stock.

NEW DESIGN FEATURES IMPROVE PLASTIC MOLDER (Q3)

Thirteen years experience in designing and building plastics injection molding machines has gone into production of a new 16-ounce capacity machine produced by Hydraulic Press Manufacturing Company.

Injection molding is the most widely used and most successful of the processes for handling thermoplastic resins. Among plastics materials most widely used for injection molding are cellulose acetates, acrylics, polystyrenes, cellulose acetate-butyrates, vinylidene chlorides and polyvinyl chlorides.

The typical cycle for injection molding is retained in the new plastics press announced.

None of the machines are available to companies not engaged in war contracts, but the company has announced a plan for placing postwar orders.

Special purpose machine built-up using standard units

ADAPTOR REDUCES COSTS USING BROKEN TWIST DRILLS (Q4)

Permitting a big reduction in inventory of twist drills and cutting costs of replacements by one half, a positive-drive collet chuck drill adaptor is offered by Zephyr Manufacturing Company. The ingenious device holds

Tool saves broken drills

drills securely and concentrically without threading or soldering.

A simple flat notch is rough-ground on the broken end of the drill before insertion into the collet. The notch slides past a pin located at the bottom of the collet. In operation this pin does the driving; the collet holds the drill in alignment; the collet nut locks drill.

MULTIPLE USE EQUIPMENT DEVISED FROM STOCK ITEMS (Q5)

Designed to use standard units, a new machine built by Snyder Tool and Engineering Company offers a good example of special-purpose equipment. This machine serves two purposes by providing interchangeability of multiple heads and bushing plates.

This new unit, used for drilling two different axle housings, uses three standard guide-bar type, self-contained Snyder hydraulic units.

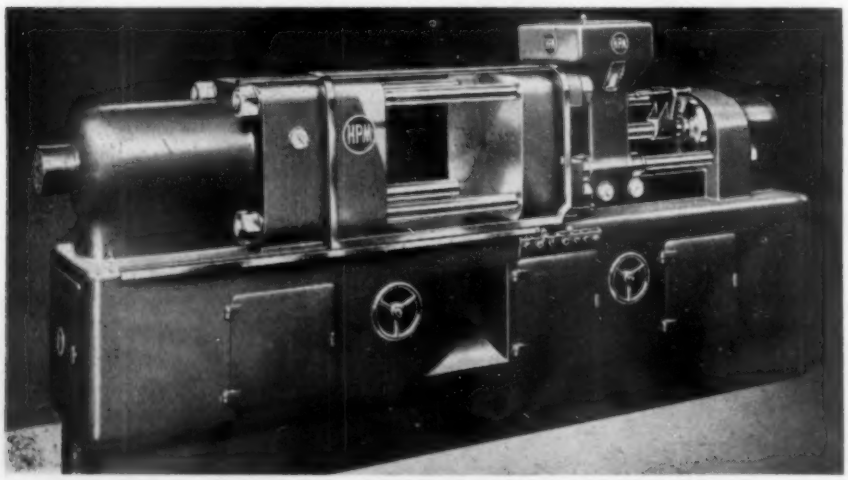
Two end units are equipped with interchangeable multiple heads and bushing plates, each set of which is used on but one of the two different axle housings.

A rear unit carries a 14-spindle multiple head in which 10 of the spindles are used as one part and four on the other. Only the tools to be used—10 or four—are set up at one time. Drill guide bushings for rear tools are installed rigidly on the fixture.

The guide bar units slide on hardened guide bars instead of ways, eliminating most chip abrasion. The welded steel base contains the coolant.

LATHE CENTER MAINTAINS CORRECT TENSION ON WORK (Q6)

Designed for pressure tool machines and work which must be held within .0001", the New Era Lathe Center made by Cesco Products, is said to eliminate guess work in arriving at correct center tension and to maintain this tension by automatic compensation for expansion of the work and by providing adequate lubrication.



Sixteen ounce capacity injection molder ready for postwar

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

(Continued on page 166)

FREE INFORMATION and SERVICE

Request the information and service you desire and keep your library up-to-date.

THREE FREE SERVICES without obligation

For your convenience these three business reply cards enable you to request quickly

1: New catalogs — bulletins listed in this issue.

2: Additional information or bulletins relative to new equipment — new materials or new processes.

3: When answering advertisements, specific information on problems or company representative's call.

HOW TO ORDER

Simply fill out the card, indicating the information or service you desire, and mail.

Be sure to write, in the square, the identifying number of the catalogs or bulletins covering new products described.

In answering an advertisement, include the name of the advertiser and indicate by a cross if literature is desired or if company representative should call. No stamp is required.

1

USE THIS CARD

for requesting new catalogs and bulletins listed in this issue.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

ADDRESS

TITLE

THE TOOL ENGINEER, OCTOBER, 1944

Write in square, number of item describing one catalog wanted ➔ ☐

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THE TOOL ENGINEER, OCTOBER, 1944

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THE TOOL ENGINEER, OCTOBER, 1944

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NAME

COMPANY

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TITLE

THE TOOL ENGINEER, OCTOBER, 1944

2

USE THIS CARD

for requesting additional information or bulletins about new equipment, materials, processes, etc.

Write in square, number of item describing one catalog wanted ➔ ☐

NAME

COMPANY

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TITLE

THE TOOL ENGINEER, OCTOBER, 1944

Write in square, number of item describing one catalog wanted ➔ ☐

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THE TOOL ENGINEER, OCTOBER, 1944

Write in square, number of item describing one catalog wanted ➔ ☐

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3

USE THIS CARD

when answering advertisements, to obtain specific information on problems, or when you desire a company representative to call.

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☐ Literature ☐ Have Representative Call

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THE TOOL ENGINEER, OCTOBER, 1944

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THE TOOL ENGINEER, OCTOBER, 1944

NAME OF ADVERTISER — PAGE NO.

☐ Literature ☐ Have Representative Call

NAME

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THE TOOL ENGINEER, OCTOBER, 1944

USE THESE FREE REPLY CARDS

They are provided for your convenience in requesting information and service . . . . .

FIRST CLASS
PERMIT No. 6091
(Sec. 510, P. L. & R.)
DETROIT, MICH.

BUSINESS REPLY CARD
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

2c.-POSTAGE WILL BE PAID BY—

THE BRAMSON PUBLISHING COMPANY
2842 W. GRAND BLVD.
DETROIT 2, MICHIGAN

1

Request for:
NEW CATALOGS
BULLETINS
BOOKLETS

FIRST CLASS
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2

Request for additional information and catalogs covering
NEW EQUIPMENT
MATERIALS
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3

ANSWERING
ADVERTISEMENTS
Requesting:
LITERATURE
REPRESENTATIVE
TO CALL

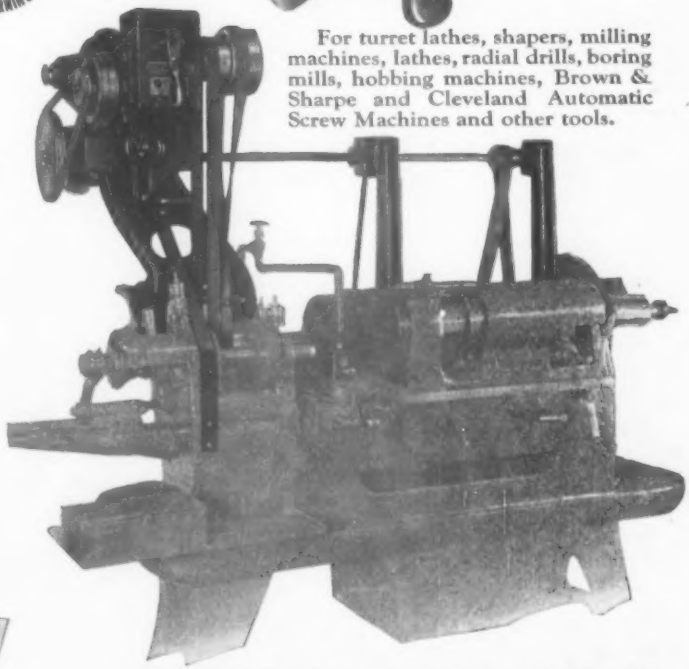
SPEED UP RECONVERSION

with

TURNER UNI-DRIVE
Motorizes Machine Tools

1. **No belts to shift. Drives to large step of cone at all speeds.**
2. **Eliminates overhead line and counter shafts.**
3. **All advantages of geared head with belt drive smoothness.**

Reconversion will call for speed and more speed. Be ready with TURNER UNI-DRIVE. Now helping to bring schedules through on time in hundreds of plants. Cuts costs. Saves time. Eases operators' work. Increases production capacity up to 25%—100%—300%. Each unit operates independently of all others—high and low speeds at will. See your dealer or write us.



For turret lathes, shapers, milling machines, lathes, radial drills, boring mills, hobbing machines, Brown & Sharpe and Cleveland Automatic Screw Machines and other tools.

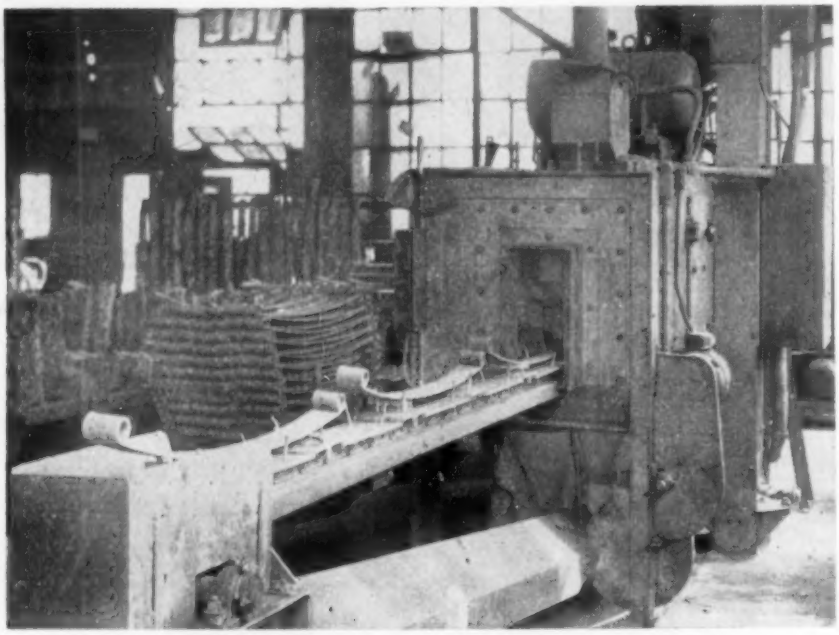
Outstanding Performance for These Typical Users

Aircraft Accessories Corp.
American Brake Shoe & F. Co.
Kellogg Division
Southern Wheel Division
Augusta Arsenal
Bendix Aviation Corp.
Brown-Lipe-Chapin
Div. General Motors
Cessna Aircraft Corp.
Chicago, Rock Island & Pacific R. R. Co.
Delco-Remy Co.
Div. General Motors
Diehl Manufacturing Co.
Div. Singer Mfg. Co.
Doehler Die Casting Co.
Electric Auto-Lite Co.
Frankfort Arsenal
Frisco Lines
Holtzer-Cabot Elect. Co.
International Projector Co.
Kohler Corp.
Monsanto Chemical Co.
The New York Air Brake Co.
Ohio Pattern and Fdry. Co.
Oneida, Ltd.
Parker Appliance Co.
Republic Steel Corporation
Revere Copper and Brass, Inc.
SKF Industries
Southern Railway Co.
The Timken-Detroit Axle Co.
The Todd Company
W. A. Sheaffer Pen Co.
Wagner Electric Co.
Worthington Pump Co.

NOW AT WORK FOR VICTORY ★★★

THE TURNER UNI-DRIVE COMPANY
(Sales Division: Turner Machinery Co.)
3416 Terrace St. Kansas City 8, Mo.

PRODUCING MACHINE TOOL DRIVES • ORDNANCE TOOLS • AIRCRAFT FITTINGS



High velocity shot peening increases fatigue life of metals.

SHOT PEENING ACCOMPLISHED (Q7) WITH AMERICAN FOUNDRY MACHINE

Increased life of stressed parts, such as gears, springs, axles, torsion bars, pneumatic drills, connecting rods, crankshafts and milling cutters, is obtained by shot peening. To better accomplish this operation American Foundry Equipment Company announce their Wheelapeening Machines.

In this new equipment a rain of metallic shot is directed against the part, under high velocity. Each shot striking the surface makes a tiny dent or pit, so that the cumulative effect is stretching surface layers by cold working. This reduces fatigue failures, because cracks do not get a chance to start.

Provision is made in Wheelapeening equipment for continuous re-use of shot, for removal of broken shot and dust and for the addition of new shot to the cycling system. The method is claimed to permit processing at a much higher speed and to reduce power requirements by 80 per cent.

TAP RECONDITIONING DONE QUICKLY ON "4-IN-1" MACHINE (Q8)

Taps can be kept in "top" condition through use of a rugged new improved tap reconditioner built by Detroit Tap & Tool Company. The reconditioner has been made into a 4-in-1 machine by adding to the machine's original functions of chamfering, spiral pointing and spiral point polishing, facilities for sharpening the entire tap by grinding the flute lengths.

HEAVY DUTY GRINDER HAS MANY NEW PRODUCTION USES (Q9)

A new heavy duty formed wheel grinding machine has been announced by Gear Grinding Machine Company. The grinder handles coarse or fine pitch gears with diameters up to 24". It takes 48" between centers.

Advanced features include faster indexing, faster work table and simplified push button control. The builder advances the argument that these will increase production.

A low base provides a low center line of work and all work areas are painted spot light buff to increase visibility. The motor driven work head spindle permits checking the work runout with an indicator. The spindle is mounted on precision tapered roller bearings.

MARKING MACHINES HANDLE GAGE HANDLES AND HOLDERS (Q10)

Acromarker with special fixtures can be used to mark plug and snap gages handles and holders. The marking device stamps in a straight line and spaces properly. Besides these uses the maker, Acromark Company, reports other industrial applications.

MELTING AND DIPPING TANK CONTROLS HEATING OF PLASTIC (Q11)

The Youngstown Miller Company has designed and built an ethyl cellulose melting and dipping tank that meets standards established for control of the plastic material. The unit employs indirect heat.

Thermostatic control is maintained over both heat exchange medium and plastic to insure optimum temperatures. The plastic is melted and preheated to proper temperature for dipping before entering the dip tank. The plastic is circulated to maintain proper level and to remove surface film.

The machine is being used to dip spark plugs, but should be useful as an adaptation for other dipping uses.

SIMPLE JIG PERMITS QUICK SHARPENING OF TWIST DRILLS (Q12)

Few mechanics can sharpen a twist drill with any degree of accuracy, according to A. D. McBurney, manufacturer of a simple jig which he claims will accurately sharpen any twist drill, 3/32" to 1- 1/16" in 25 seconds. The jig is mounted next to a grinding wheel and handles lengths up to 11".

(Continued on page 168)

INFORMATION FREE

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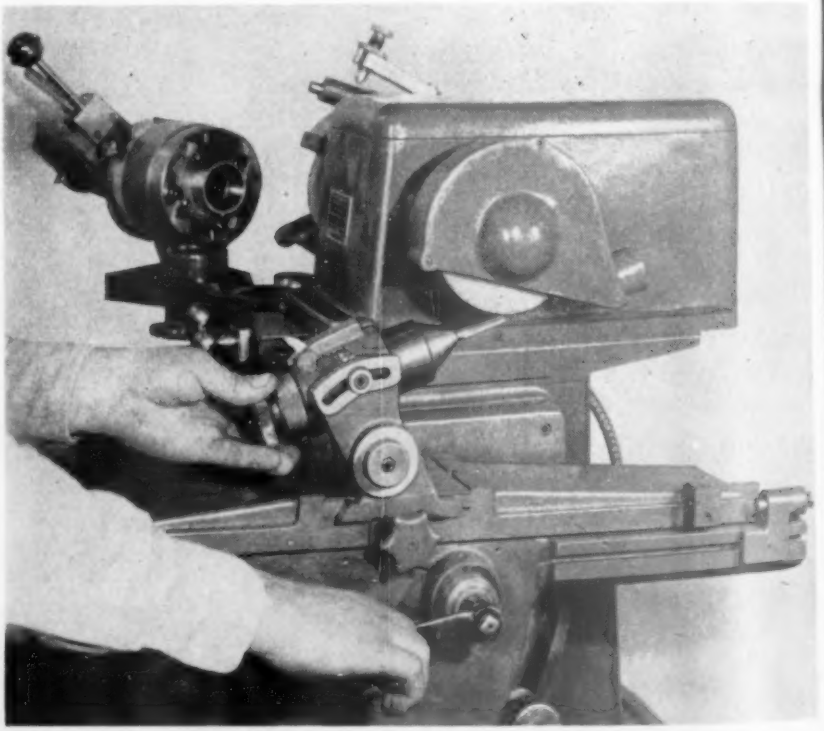
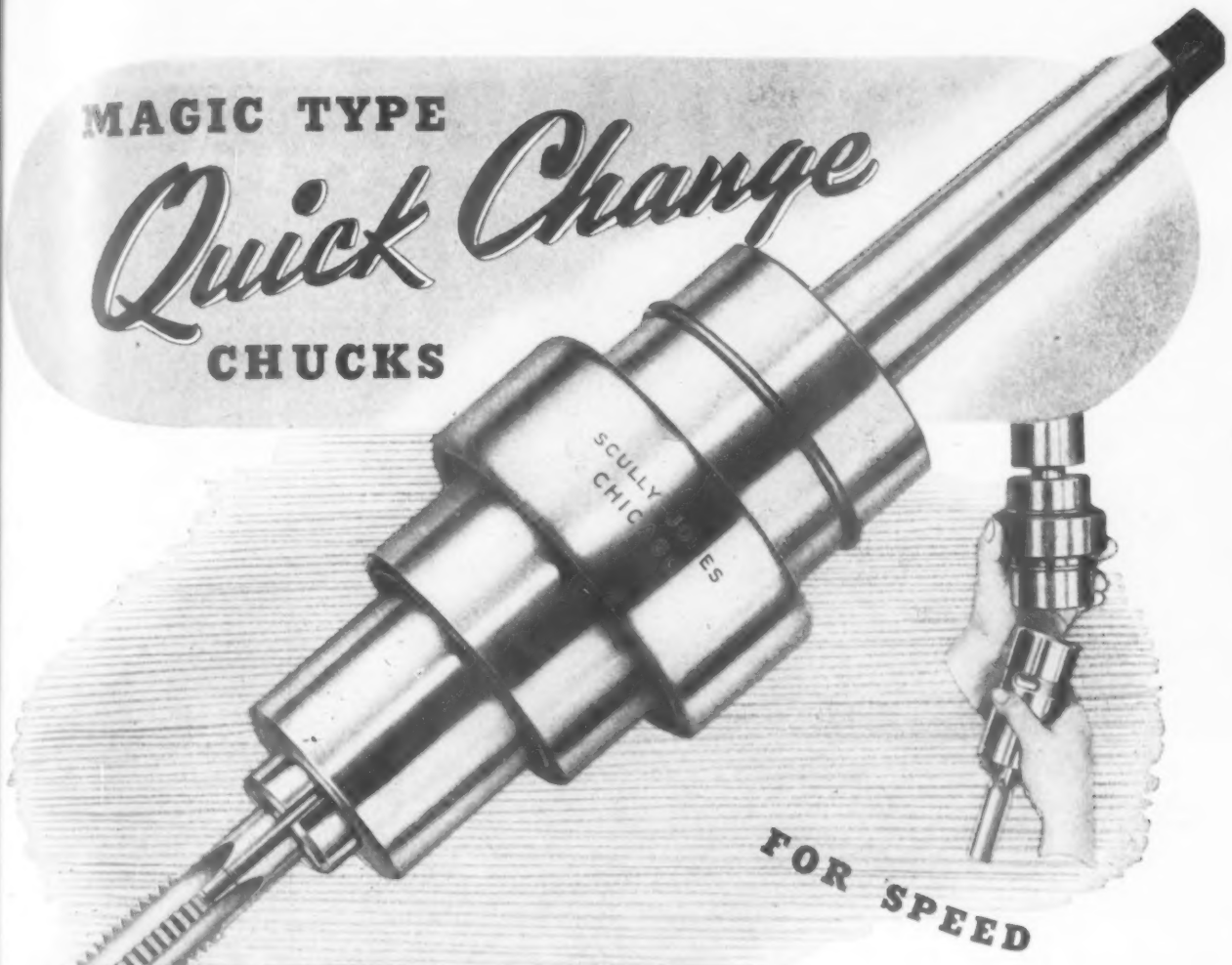
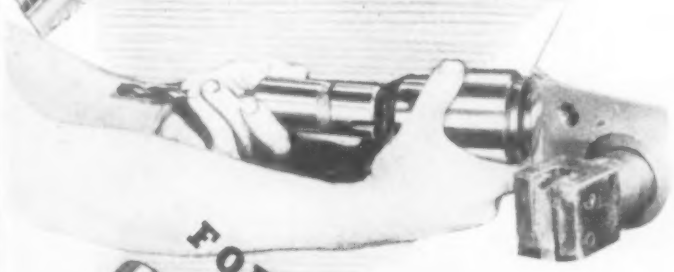


Spiral pointing application on improved tap reconditioner

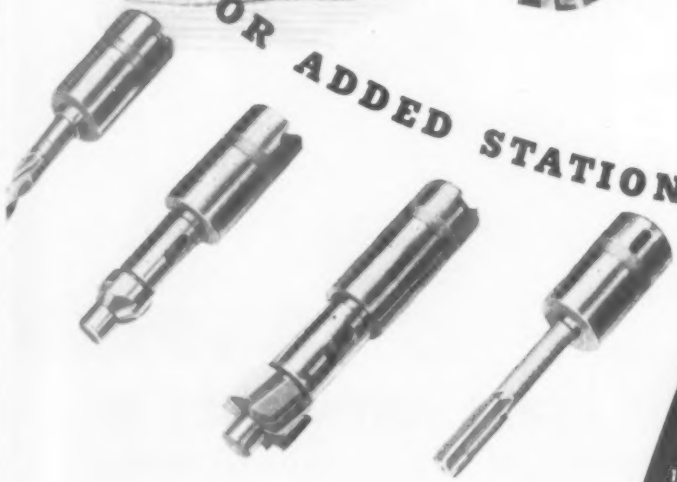
MAGIC TYPE *Quick Change* CHUCKS



FOR SPEED



FOR ADDED STATIONS



. . . SAVE SET-UP TIME

• Add many stations to your machines by using Magic Quick Change Chucks.

Change tools in your Drill Presses, Turret Lathes and Boring Machines without stopping the spindles.

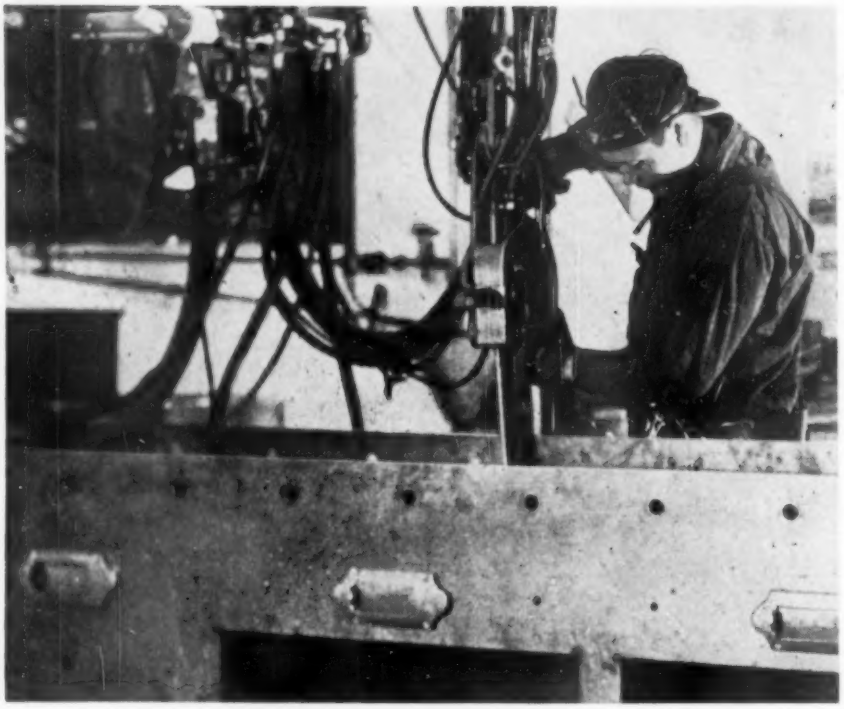
By simply raising the locking ring, the centrifugal force throws two balls out of position, permitting the collet to drop out automatically.

Collets of various types can be furnished to accommodate Drills, Reamers, Boring Bars, Counter-bores, Core Drills, Taps and Special Tools.

Send us sketches or blueprints for recommendations and quotations.

Scully-Jones AND COMPANY

1901 SOUTH ROCKWELL STREET • CHICAGO, U. S. A.



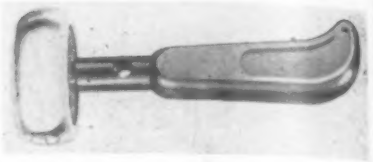
Positioning Portable Spot Welding Gun

PORTABLE SPOT WELDER SPEEDS WAR TIME DELIVERY *(Q13)*

Progressive Welder Company has developed and put to use a new portable spot welding gun for use on equipment too heavy to be spot welded on conventional equipment. The device was developed to break a bottle neck in production of military cook stoves at the Washington Stove Works.

Stove assemblies were formerly riveted, but the new welding gun, counterbalanced and suspended from cables, permitted great savings in time by taking the welding to the unit. Possibilities of either burning metal or underwelding are controlled by automatic time and heat devices.

Thus far the portable welding gun has been used in this application, but many other uses are suggested.



New fixed limit gage

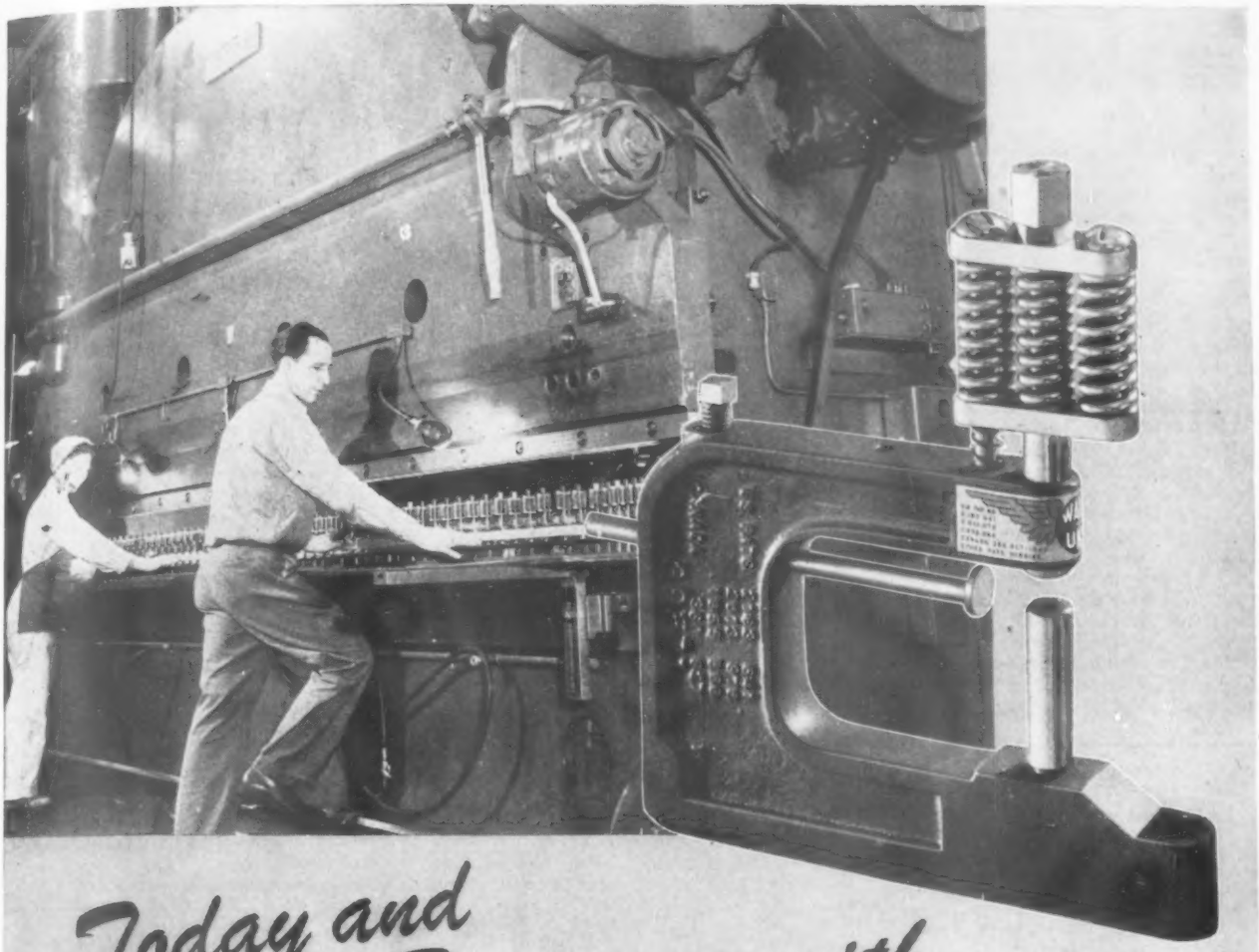
EUROPEAN GAGE IMPROVED IN UNITED STATES PRODUCTION *(Q14)*

Standard Gage Company, Inc., is now in production of a revolutionary improvement in fixed limit type gages. This general type of bore gage has successfully been used in Sweden and other European countries. Some of these gages have been supplied in lim-

(Continued on page 170)

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.



Today and Tomorrow with WALES HOLE PUNCHING UNITS

An impressive setup of over 150 Wales Hole Punching Units in a press brake at Boeing Aircraft Company, Seattle, Washington.

TIME-SAVING, MONEY-SAVING FEATURES

1. Usual time-consuming adjustments of conventional set-ups are eliminated.
2. Punch and die held in perfect alignment by holder.
3. Each unit is independent and self-contained.
4. Straight line, staggered and scattered patterns punched with same units.
5. Same group of units may be used interchangeably on press brakes and stamping presses.
6. Nothing is attached to press ram.
7. Individual units may be instantly removed or reset.
8. Punches may be interchanged without disturbing set-up.
9. Die setting and press "down time" reduced to minutes.
10. Same units may be used and reused in unlimited patterns.

TODAY Wales Hole Punching Units are helping to turn out war material faster and *faster and faster.*

TOMORROW these units will be aiding in producing civilian metal products in greater quantities and at greatly reduced costs because of the many patented features at the left.

Get acquainted with how Wales Hole Punching Units fit into your post-war production setup *by writing for completely illustrated catalog.*

WALES-STRIPPITT CORPORATION

GEORGE F. WALES, *President*

353 Payne Avenue — NORTH TONAWANDA, N. Y.

(Between Buffalo and Niagara Falls)

ited numbers to Americans from European sources. Standard Gage is now prepared to manufacture and supply North and South America.

The gaging head of the TeBo gage is a section of a sphere with a hard chrome protective plating. Through plating and because the points of gaging contact are as numerous as the number of theoretical lines which might be inscribed on its surface, they retain accuracy over long periods of service. Records of 50,000 gagings are on file for a single unit.

Simplicity of design makes them ideal for use with unskilled personnel.

LATHE ANGLE PLATE AIDS ELIMINATION OF SPECIAL JIGS (Q15)

Best Tools Corporation has marketed a new lathe angle plate with accessories, which they claim will eliminate many costly special jigs and fixtures usually needed to machine intricate jobs on a lathe.

The lathe face plate attachment is positioned by a locating nose plug in the head stock spindle, and is then bolted to the face plate. It is equipped with an adjusting screw and the necessary pages so work can be located accurately.

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

High-frequency induction quenching table

TWO STATION HARDENING QUENCHING TABLE ANNOUNCED (Q16)

A general purpose, two-station hardening and quench table for use in connection with high-frequency induction heating generators and suited to a wide variety of machine parts requiring surface hardening or localized heating is announced by Induction Heating Corporation.

The table is well suited to the selective hardening of a variety of machine parts.

(Continued on page 172)

DO YOU WANT TO SHARPEN . . .

. . . broaches up to 84" long?
. . . small broaches?
. . . flat broaches?
. . . round broaches?
. . . more accurately?
. . . WITH WOMEN OPERATORS?

You need only one machine to do all this: the new COLONIAL CS-2-84 (*) Sharpening machine. In addition to all the well known Colonial features, you will find on this machine such important features as:

Full anti-friction double-row roller action to guide the sliding head plus use of light-weight alloy castings for the moving head, reducing weight to 1/3 that required with iron or steel construction. These two features provide a surprising ease of sharpener operation. To maintain this ease for life, moreover, all anti-friction bearings are completely sealed against entry of dust.

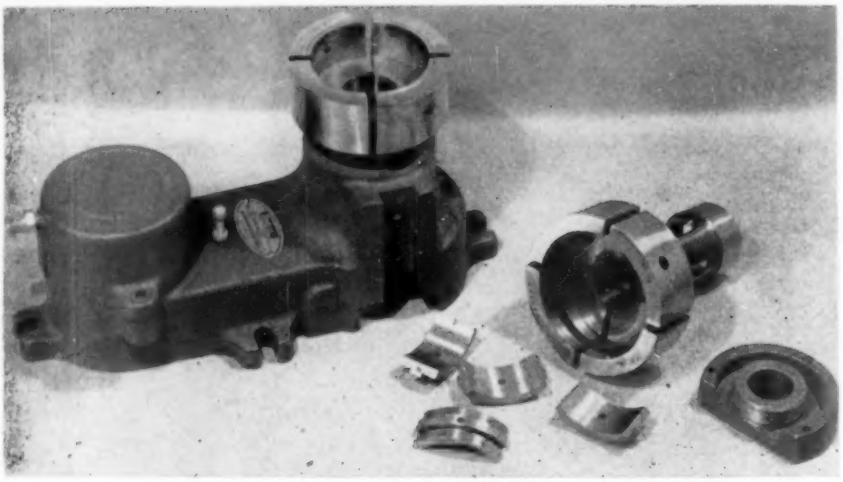
Where floor space is at a premium, a special roller curtain design (to protect ways of machine) enables, at slight additional cost, a reduction of 6 ft. in total floor space required for the machine when sharpening maximum length broaches.

Also available as extra equipment are double-ratio micrometer hand wheels to control feed to the ten-thousandth of an inch. Makes possible maintaining identical step per tooth in regrinding broaches.

* For sharpening broaches up to 72 in. long, there is also the CS-2-72 with the same design and operating features.

colonial BROACH COMPANY
DETROIT 13, U.S.A.
Broaches — Broaching Machines - Broaching Equipment

BUY U.S. BONDS STAMPS



Adapter increases capacity of air chuck to four inches

SPECIAL COLLET AIR CHUCK ADDS GREATER CAPACITY RANGE (Q17)

Redmer Air Devices Corporation offers a new development for their No. 2 Special Collet Air Chuck. By use of an adapter, a master collet and pads can now be used giving capacity up to four inches. This changeover requires only the removal of the stop rod and insertion of the adapter block.

The master collet screws onto this base block holding the collet stationary, thereby adhering to the original principle of all Redmer air chucks in that the collet remains rigid.

POROSITY TESTER CHECKS MATERIALS THROUGH VACUUM (Q18)

Relative porosities of materials can be determined through use of a tester patented by Stuart H. Hahn and Robert H. Judson. The patent has been assigned to B. F. Goodrich Company. Porosity is determined by degree of vacuum in a chamber which is a part of the equipment.

The apparatus was built to test sponge rubber, but will have other useful applications. Porosity determination is by means of gases or atmosphere drawn through material under test and indicating rate of flow.

The equipment is portable enough to be lifted by hand. It consists of a vacuum chamber placed in contact with material under test, an evacuating fan, outlet for emitted gas and a pressure gage for indication of degree of vacuum.

Simple drilling unit

SINGLE PURPOSE DRILLING UNIT PROMISES FEW TROUBLES (Q19)

Simplicity of design marks the new single purpose automatic drilling unit produced by Simplex Engineering Company. Three models are available—handling drills from #80 to 1/8" diameter.

The self-contained unit can be mounted at any angle or plane and operated automatically by electrical circuits as desired. Mounting of a number of these units in a special machine

(Continued on page 174)

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

How to Grind

GEAR-SHAPER CUTTERS

on the Taft-Peirce 6″ Rotary Surface Grinder

Above, T-P Surface Grinder for small rotary work up to 6″ in diameter. Exclusive tilting wheelhead enables machine to do difficult angle and shoulder work.

Immediate right, grinding a threaded hole-type Fellows cutter, with Taft-Peirce adapter.

Far right, grinding a tapered shank-type Fellows cutter, with Taft-Peirce adapter.

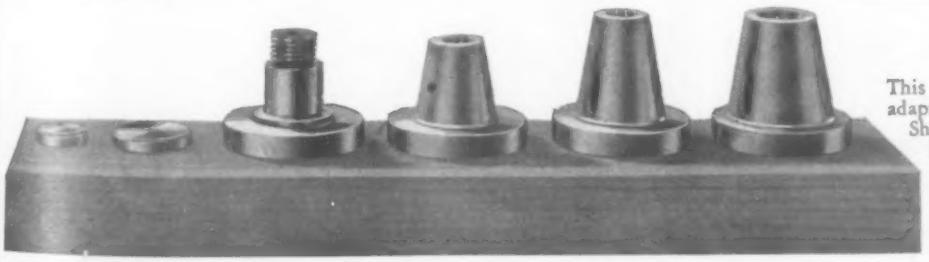
The set of adapters, shown below, makes it possible to grind all Fellows Gear Shaper cutters quickly and accurately on the Taft-Peirce 6″ Rotary Surface Grinder . . . to which the only alternative for this particular type of work is an expensive production machine. Chuck can be tilted 7°, and wheelhead spindle swivels in a vertical plane from horizontal to 30° below wheel center, thus facilitating grinding at any angle encountered in this type of work. Send for prices and delivery dates on Taft-Peirce adapters for grinding Fellows cutters.

The

Taft-Peirce

Manufacturing Company

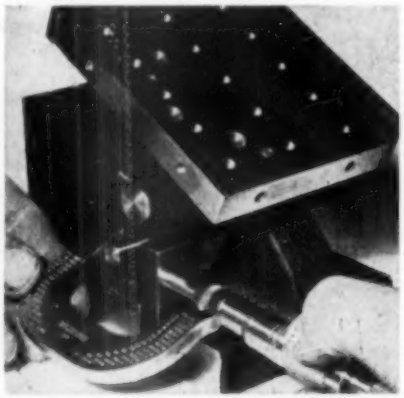
WOONSOCKET, R. I.



This is the complete set of six T-P adapters for grinding Fellows Gear Shaper Cutters. These adapters may be purchased either individually or in sets.

will insure rapid drilling or reaming, makers declare.

Emphasis has been placed on a minimum of moving parts to reduce wear and insure longer trouble free operation.



Angles to a minute

NEW TOOL MEASURES ANY ANGLE TO 90° ACCURATELY (Q20)

A time-saving device for setting or measuring any angle from 0° to 90° to accuracy within one minute is announced by Boston Tool and Die Company. To use the Bemisine, as it is called, all that is needed in a 2" micrometer and a table of sines and cosines.

The Bemisine is a multiple purpose tool room accessory in that it has provision for holding small work pieces for machining, grinding or inspection operations. It is especially recommended for use with grinding or jig boring equipment where angular setups are difficult.

INFORMATION FREE

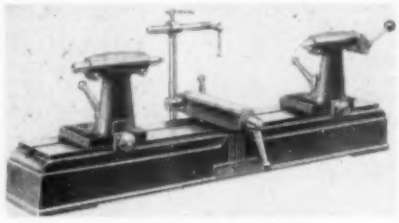
For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

BENCH CENTER EMPLOYS TESTED DESIGN FEATURES (Q21)

War production calls for precision standards that have placed emphasis on need for accurate and easily-operated inspection and testing equipment. From this need Delta Manufacturing Company has devised their new bench center which embodies latest developments for accuracy and convenience.

A new feature of this bench center is design, construction and operation of the indicator support bracket: mounted on a base that can be firmly and quickly locked in any position on the bed by merely operating a handle in front.

The machine has a maximum distance of 19½" between centers, the bed is 32" long, 5½" wide. Dimensions of the ground bed are 4½" by 30".



Delta bench center

Drill press converter

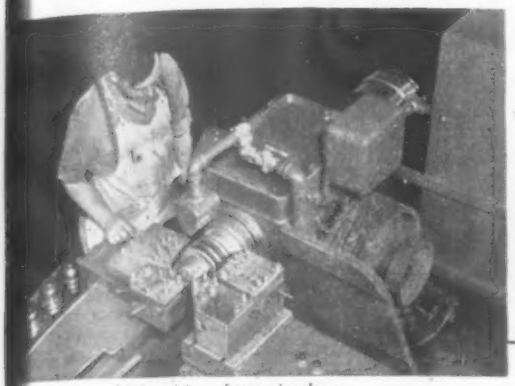
ANGLE BRACKET MAKES DRILL PRESS MORE VERSATILE (Q22)

An angle bracket for use on a drill press will make it the most versatile, handiest tool in the shop. This claim is made by Nobur Manufacturing Company, builder. The bracket will change a drill press into an all-purpose machine for angle drilling, polishing, buffing, sanding, rotary filing, wire brushing, tapping, grinding and honing.

The angle bracket is available for all

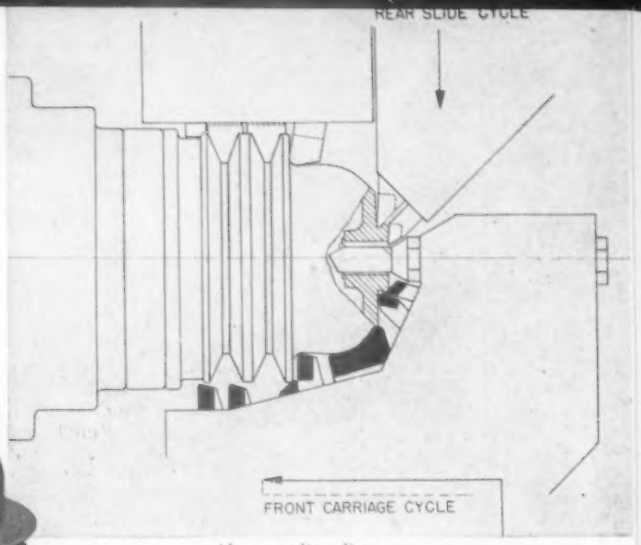
(Continued on page 176)

14 T.C. Tools Turn This Job In 1 Operation



Above, machining 14 surfaces simultaneously on Sundstrand Automatic Lathe.

Above, finish turned pulley.



Above, tooling diagram.

TIME STUDY FACTS

MATERIAL—Cast Iron.
HARDNESS—Brinell 179-217.
TENSILE STRENGTH—24,000 lbs. P.S.I.
MACHINE—Model 10 Sundstrand Automatic Lathe.
CUTTING TOOLS—100% Tungsten Carbide.
STOCK REMOVED—1/4" all over.

Feeds and Speeds

FRONT TOOLS

Turn O.D. of belt grooves and O.D. of radius diameter—Three T.C. tools.
Turn O.D. of small hub—One T.C. tool.
Chamfer hub—One T.C. tool.
Chamfer O.D. of front groove—One T.C. tool.
Bore shaft hole—One 1/4" S.S. tool bit and boring bar.
Form large radius on head—One T.C. tool.
} .0054" feed

REAR TOOLS

Turn grooves—Two T.C. tools.
Face head and undercut—One T.C. tool.
Face and form radius—One T.C. tool.
Chamfer O.D. of rear groove—One T.C. tool.
Face hub—One T.C. tool.
} .0045" feed

All tools work together and speed slows down from 132 to 56 r.p.m. for finishing. Cycle time of this job is 4.40 minutes, floor-to-floor.

Sundstrand Automatic Lathe Performs Facing, Turning, Grooving and Boring Operations Simultaneously . . .

Included in the numerous outstanding processing methods of the White Motor Company of Cleveland, Ohio, is this pulley machining job. It's an excellent example of the use of multiple tooling on high production turning.

The only previous machining on the pulley, besides drilling small hole in end, is to bore the inside diameter and face the open end surfaces for locating purposes. It is then completed on a Sundstrand Automatic Lathe. The machine is provided with an automatic cycle of rapid approach, feed, dwell, rapid return and stop. To improve finish, a two speed motor automatically reduces spindle speed as forming tools approach end of cut. The operator gages and checks the part and is free to do other work during the automatic machine cycle.

This is but one of many installations wherein a Sundstrand Automatic Lathe is used for profitable high production turning. *Due to its quick cycle changeover features and its ease of set-up it is also saving time on a great number of short-run turning jobs.* Our engineers will be glad to assist you in determining how this modern lathe can be profitably applied to your work. Call on them without obligation.

How to Lower Turning Costs

This free 44-page booklet contains helpful tips on processing turning jobs, together with illustrations and tooling diagrams. Complete engineering and production data are given on many jobs similar to yours. Write for your free copy today. Ask for bulletin 829.

SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

ARMY-NAVY

SUNDSTRAND MACHINE TOOL CO.

Rigidmils • Fluid-Screw Rigidmils • Automatic Lathes • Hydraulic Equipment • Drilling and Centering Machines • Special Milling and Turning Machines

2532 ELEVENTH ST., ROCKFORD, ILLINOIS, U. S. A.

popular models of drill presses whose construction embodies a round tubular column from 2¾" to 3 29/32" in diameter.

Norton precision form grinder

ABRASIVES FIRM ACQUIRES (Q23) NEW PRECISION FORM GRINDER

Newly added to the Norton Company line is the Bura-way Grinder, built on the growing concept that metal cutting tools should have "constant relief in the direction of feed". Norton has acquired all rights to the grinder and will add it to their comprehensive line of cylindrical and surface grinders, tool room grinders and lappers.

Added factors which will contribute to longer tool life include means of precise control in grinding tool angles, close control of the amount of metal removed in renewing cutting edges, precise reproduction of form tools within close dimensional limits, and production of a fine surface finish at the tool's edge to give increased production per grind and a clean cut.

Relief angles are controllable within minutes of arc. The unit, now equipped for wet grinding, is equally suited to the rough or finish grinding of tools.

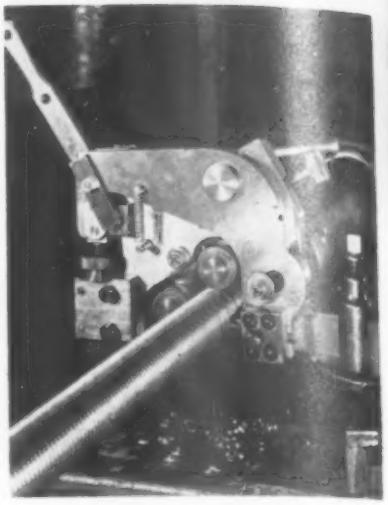
ANGLE PLATE HOLOCATER (Q24) LOCATES AND MEASURES WORK

An improved precision layout tool—the Dayton Rogers Manufacturing Company's Angle Plate-Holocator—can be used for drilling, locating, measuring, lay out and checking.

MICRO-TURNTHREAD DEVICE (Q25) HELPS AWKWARD LATHE SETUPS

A versatile new lathe attachment has been developed by Blank & Buxton called the Micro-Turnthread. It was designed to overcome difficulties encountered in turning or threading long, small-diameter shafts.

The device is a combination tool holder and follow rest, installed in the lathe tool post. Embodied in the tool holder are rollers with screw adjustment for variation in work diameter. Micrometer adjustment of the cutting tool itself is provided. A quick retractability feature for moving tool in and out to start or end threading cuts is provided.



Useful lathe attachment

(Concluded on page 178)

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For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

—NEW EQUIPMENT—

The attachment opens a wide range of possible applications. Builders have just begun to explore uses. They claim the attachment will bring many older lathes up to precision performance.

ADJUSTABLE HOLE CUTTER ADAPTABLE FOR MANY MATERIALS (Q26)

An adjustable hole cutter, designed to cut clean holes in sheet metals, wood or plastics in diameters from 5/8" to 2½" is announced by Bruno Tools. These tools are used in drill presses, electric motors or hand braces.

ELECTRONIC CONTROLLER BUILT FOR BATTERY WELDING (Q27)

A precise electronic forge-pressure timer has been incorporated in the General Electric Company line of capacity discharge controls for stored-energy type resistance welding machines.

The new timer, designed for dual pressure spot welding machines of the capacitor discharge type, functions to supply accurately timed forge pressure, so that the required welding energy, cracks, indentations and sheet separations are reduced.

Timing circuit assures a regulated DC source of voltage.

THE END

INFORMATION FREE

For complete information on equipment listed in this section, list the key number preceding each item and your name and address on postcard coupons—page 163.

This FREE Circular Has Helped Thousands

CUT SET-UP TIME on ANGLE MACHINING JOBS

"COSTS REDUCED 50%" Often Reported.

This informative circular has introduced hundreds of plants, large and small, in all industries, to the "UNIVERSAL" 3-WAY ANGLE-SET VISE.

Thousands of extra copies have been requested by scores of prominent manufacturers for distribution to heads of their Tool Rooms, Machine Shops, Repair and Assembly Departments and to Branch Plants.

It contains the complete story of how to use the "UNIVERSAL" 3-WAY ANGLE-SET VISE to *Cut Costs — Speed Work — Lessen Labor* on all angle-set jobs. Complete specifications. 12 Job Application Sketches that suggest new methods of handling angle-set jobs: special information on Tool Bit Grinding: a suggested Cost Analysis form.

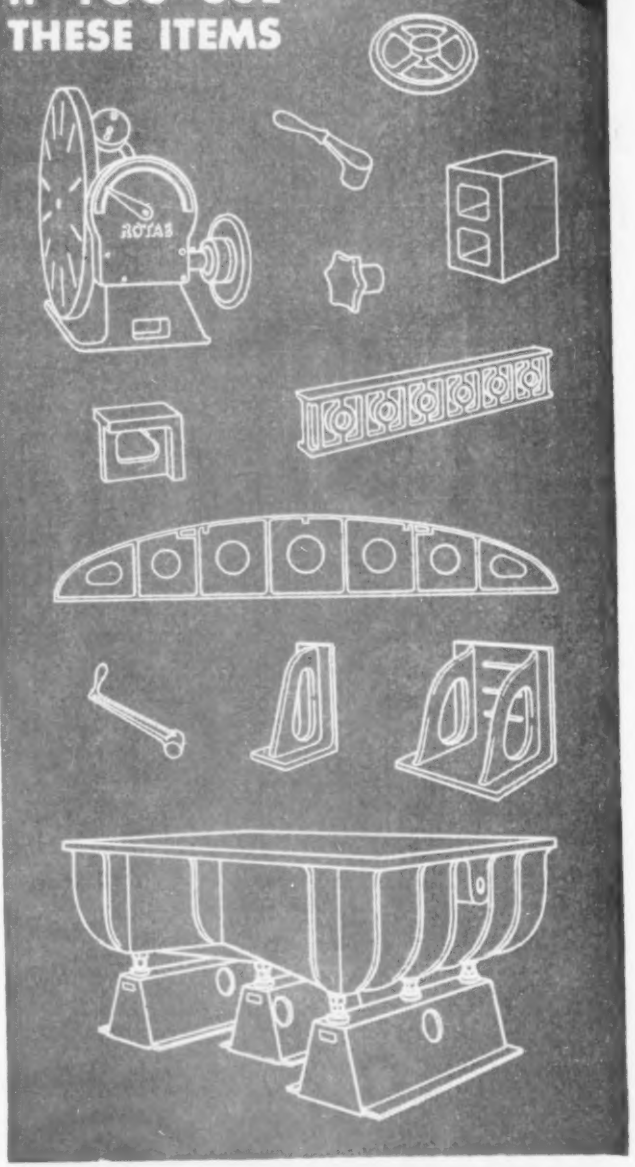
It shows you how you can save 1/3 to 1/2 the time now spent on set-ups — reduce your costs and get more out of your present equipment — and ease many headaches.

Send for your FREE copy of this valuable information today.

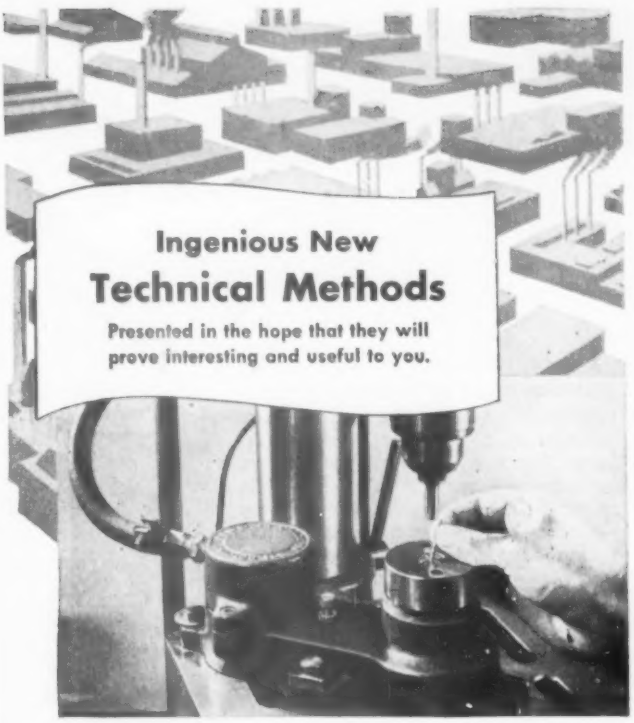
UNIVERSAL VISE & TOOL CO.
131 Main Street
Parma **Michigan**

YOU'LL WANT A COPY OF THIS *New Catalog*

IF YOU USE THESE ITEMS



MACHINE PRODUCTS CORPORATION
6771 E. McNichols Road • Detroit 12, Mich.



Ingenious New Technical Methods

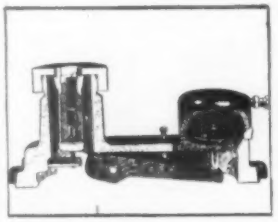
Presented in the hope that they will prove interesting and useful to you.

Now—Air Operated Collet Chuck Relieves Second Operation Work on Screw Machines

Work formerly requiring automatic or hand screw machines can now be done at much less cost through the combination of this new air chuck and any drill press. The Redmer Air Chuck is a collet air chuck using standard Brown & Sharpe type screw machine collets. The collet remains stationary, the opening and closing controlled by a sleeve action.

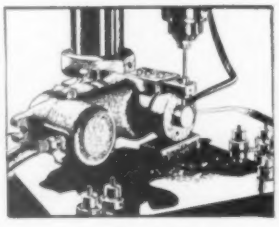
By using a collet as the chucking means, slight variations in the diameter of the work as frequently experienced with automatic and hand screw machine products can be permitted without sacrificing accuracy or concentricity. Thus accomplishing an important saving in time and cost.

The air chuck is an ideal tool for holding parts for drilling, milling, slotting, burring, chamfering, boring, counterboring, tapping, threading, reaming and other work where the machine operation should be concentric with the chucking surface. It is adaptable to many different jobs merely by changing collet and stop. This results in saving of valuable production metals and materials. The chuck will take any type work whether round, hex, square or rectangular, and permits full efficiency of the operator, as it is operated by a foot operated valve thus leaving hands free to load and unload—reducing fatigue and cutting unproductive time to a minimum.



An air operated collet holding fixture for precision chucking or machine tools

Wrigley's Spearmint Gum, too, is a help on the job. For chewing gum helps relieve dry throat, and helps ease fatigue brought on by the strain of work. And at the same time you are chewing and getting the benefits of swell tasting Wrigley's Spearmint, both hands are free and you need not take a "time out." The Army and Navy have recognized these benefits and are now shipping overseas *only,* all of the limited production of Wrigley's Spearmint. When Wrigley's Spearmint can again be produced in sufficient quantity for all, the valuable benefits of Wrigley's Spearmint Gum now being proven on the battlefield will apply to industry here at home.



Chuck can be mounted on angle for angle milling job

You can get complete information from Redmer Air Devices Corp., 601 West Washington Blvd., Chicago 6, Ill.

Y-152

NEW LITERATURE

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

OF INTEREST TO PRODUCTION EXECUTIVES

(1135) Heat Oxidation

Three processes which are applied to steel and iron to prevent oxidation at high temperatures are described in a new folder circulated by Metallizing Engineering Company, Inc. The processes are called Metcolizing and are said to increase service life of heat treating equipment to 800 per cent. The processes lend themselves to shop production methods. Temperatures to 1800° F. can be handled.

(1136) Precise Gaging

Metrical Laboratories, Inc., announce release of new literature describing their external indicating gages, with particular emphasis on indicating rings of the snap gage type. This type gage can be applied while the part is still in the machine with readings to .000025" accuracy claimed. Other gages described include those designed to measure slot and thickness, three-cornered parts on centerless grinding, thickness gages and the Metricator.

(1137) Clamping Dogs

Time savings are claimed for the Quik Clamp Manufacturing Company's lathe and grinding dogs in a new circular. Loading and unloading a Quik Clamp Dog can be done as fast as picking up and laying down piece parts. No wrench or screwdriver is needed and the dogs can be used on soft or hardened shafts. Sizes are from ⅛" to 2½".

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1138) Locking System

Bardwell & McAlister, Inc., is circulating a new catalog covering the Rosan locking system. The catalog is complete with sizes, styles, illustrations and tabular matter. Data sheets are titled and show revision dates. Attractively bound.

(1139) Company Pride

Institutional in nature, "Norton Folks", published by Norton Company, covers contributions to industry. Handsomely illustrated, the brochure touches company products in war and peace. While frankly directed at company employees, the book is an index of products of the Norton Company.

(1140) Liquid Handling

Efficient handling of liquids has become an important part of virtually all manufacturing ventures, according to Bowser, Inc., which is now circulating a new pamphlet describing typical equipment. Many industrial applications are covered in text and illustration.

(1141) Portable Pumps

"Rex Pumps" is the title of a new folder describing pump products of the Chain Belt Company. Covered in text, illustration and tabular matter are a series of portable pumping systems from 3000 to 125,000 G. P. M. Charts in the back section give formulae for figuring size of pump for any given job, tables of water friction, altitude lift charts and pressure conversion tables.

(1142) Steel Information

Three publications of Crucible Steel Company of America are announced as being in active demand. Titles are "Annealing of Steel", "Cold Rolled and Cold Drawn Specialty Steels" and "Drill Rods". The titles are self-explanatory. The first is a discussion of principles of softening steel through

(Continued on page 188)

New Book on Tools for Obtaining Accurate Thread Forms in Less Time

Remarkable savings are being made in thread grinding through the use of the new Tru-Thread Diamond Tools for dressing thread grinding wheels.

Tru-Thread Diamond Tools employ a radically new principle, applied for the first time by Wheel Trueing engineers, and utilize the hard characteristics of a diamond of a shape never before used for such a purpose.

The results of this new development are reported by users who tell us—for example—that with Tru-Thread Tools they are running three to four times as many pieces as they obtained with their previous tools.

Tru-Thread Tools obtain wheel forms quickly and accurately and leave the wheel grain sharp and free-cutting. Wheels cut clean, hold their form longer and grind more pieces between dressings. Wheel cost, tool cost, and cost per piece all are reduced accordingly.

These tools, which are made in types for dressing each specific form, are completely described and illustrated in a new booklet which we will be glad to send you on request. If you have thread grinding equipment, this booklet will point the way to substantial savings. Send for your copy.

WHEEL TRUEING TOOL COMPANY

3200 W. Davison Avenue
Detroit 6 • Michigan

575 Langlois Avenue
Windsor, Ont. • Canada

annealing practices in considerable detail, suitable for those who are making a study of the subject. The latter two issues present properties and some specifications in tabular form.

(1143) Tapping Machines

Two catalogs have been made available by Warner & Swasey Company covering precision tapping and threading machines. The company recently acquired rights to a complete line and is preparing literature describing the equipment. The two catalogs now ready cover specification data on the complete line and describe the smallest unit. Others will soon be available.

(1144) Tungsten Electrodes

Tungsten rod for use in atomic hydrogen, helium and argon arc welding is covered in a new bulletin of the Callite Tungsten Corporation. The folder briefly treats some applications and includes a chart on standard dimensions.

(1145) Oil Grinding

Of interest to all who have grinding problems, "Grinding with Oil" just published by the D. A. Stuart Oil Company, covers the subject concisely, presenting valuable data to aid in decisions on oil for grinding. The book is well illustrated.

(1146) Sump Cleaning

W. R. Carnes Company has ready a new folder treating their sump tank cleaner, a portable unit that is said to clean all sludge, chips, oil and coolant from a sump tank is less than 10 minutes. Specifications are given for a typical model.

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.

(1147) Canadian View

Post war opportunities for those interested in manufacture of metal products provides the theme for a brochure issued by the Hamilton Bridge Company, Limited. The authors show trends in industry and point the way to possible future markets. Copies are limited.

(1148) Heat Treating

Useful to heat treaters, production engineers and tool room foremen is the "Heat Treating Guide" published by the Carpenter Steel Company to cover the firm's matched tool steels. Use of the handbook offers control of hardness to close specifications, it is said.

(1149) Temperature Brazing

Number 27 of Temperature Brazing News, published by Handy & Harmon illustrates representative examples of marine metal-joining operations. Low temperatures are advocated for increased production.

(1150) Aviation Fasteners

Just released is the current "in stock" list of aviation fasteners of Manufacturers Screw Products. The catalog lists quantities for immediate delivery.

(1151) Reduction Units

A comprehensive exposition of Speedaire fan cooled worm gear reduction units is contained in a new catalog edited by Cleveland Worm & Gear Company. The principle is fully detailed by photographs, charts, diagrams and engineering tables. The design engineer will find carefully detailed material for planning installations, with illustrative examples.

(1152) Regulator Bulletin

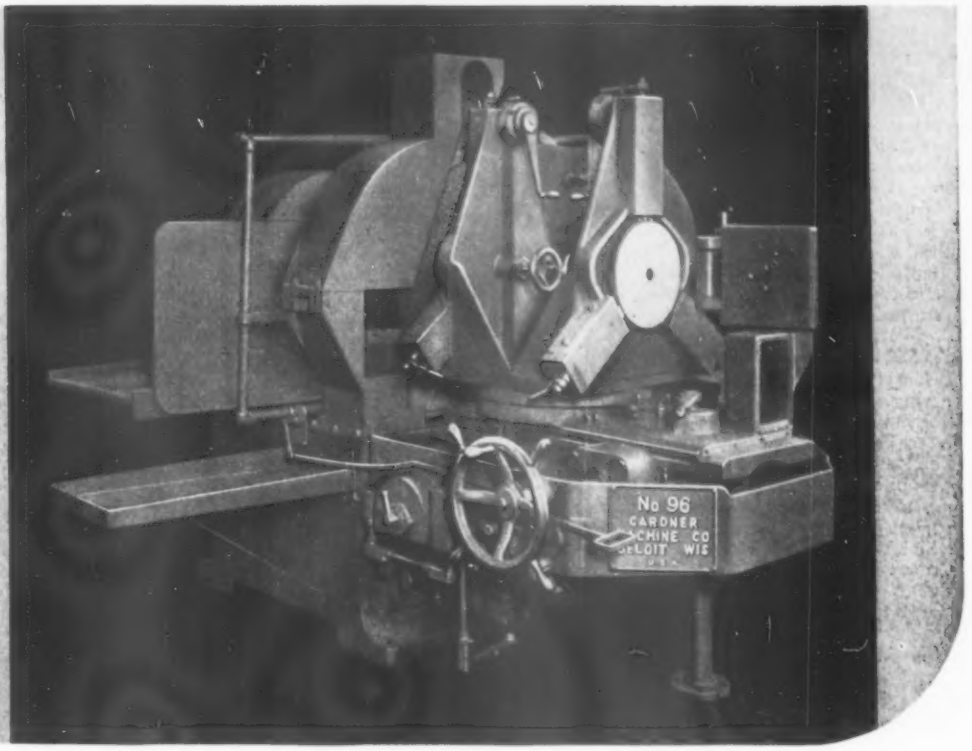
Illustrating design and construction of Victor single and two-stage reduction regulators, Victor Equipment Company is circulating their new bulletin. Cutaway photographs show build-up for regulating devices built by the company, together with pertinent specifications.

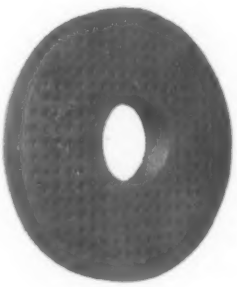
(1153) Forgeable Steels

"Evaluating the Forgeability of Steels" is the title of a late publication of Timken Roller Bearing Company. It contains for the first time recommended forging temperatures of 68 steels. Apparatus and procedures used for determination of these data by the hot twist test are described and results interpreted.

(Concluded on page 190)

Solution to a *tough* flat surfacing problem!





GARDNER WIRE-LOKT ABRASIVES ARE *Modern* CUTTING MEMBERS

REMOVING from 1/16" to 1/4" of stock from the surface of a steel billet 13" in diameter, or 16" square—that's really a TOUGH job — right?

That's what is accomplished by the Gardner No. 96-36" Hydraulic Surface Grinder illustrated here.

The big guns of the Navy and of the Field Artillery, all require a careful checking of the analysis of the steel used in their barrels. A large section, or billet, is cut from each; it must be ground on one face, to a fine finish which meets the requirements of the analyst.

This TOUGH job is handled on this Gardner Surface Grinder at the rate of 20 pieces per hour on, say, a billet 8" square — other sizes at proportionate rates.

Check the possibilities of GARDNER-GRINDING your flat surface jobs—TOUGH or simple.

WRITE FOR OUR NEW 8-PAGE BULLETIN!

GARDNER MACHINE COMPANY

442 East Gardner Street , , , , Beloit, Wisconsin, U.S.A.

(1154) Profile Metering

Physicists Research Company has just issued a new and enlarged technical bulletin which is a complete revision of a former publication. This edition is in response to requests for information on the firm's profilometer. The issue is a Technical Supplement to the bi-monthly Profilometer Comments. The paper discusses technical aspects of the electronic measuring instrument.

(1155) Spring Designing

Emphasizing importance of correct spring design, Muelhausen Spring Corporation has just published a new booklet called "Springs Designed for the Job Improve Product Performance". The publication illustrates the five basic types of springs and shows a wide variety of the shapes and sizes into which these five types may be designed. Covered also are 12 commonly used spring materials with description of characteristics.

NEW BOOKS

How to Machine Parts on Turret Lathes. Warner & Swasey Company. 64 pages. Price $1.

An integral part of a training program instituted by Warner & Swasey, this new tooling guide book is available to the public. It condenses in simplified form directions for performing all types of turret lathe work. This current publication is angled at training problems of reconversion and returning of service men from overseas. A special price of 50 cents has been established for turret lathe operators.

* * *

Seamless Steel Tube Data. Seamless Steel Tube Institute. 320 pages. Price $2.50.

An ambitious publication covering in four sections and index, the story of seamless tubing. Intended as a service to manufacturers and users of equipment employing carbon-steel and alloy tubing. Section headings include General Data, Mechanical Tubing, Pressure Tubing and Reference Tables. Also included is a Glossary and Index. The volume is bound loose leaf and supplementary sheets will be supplied as they are published.

* * *

SAE Handbook, 1944 Edition. Society of Automotive Engineers. 630 pages. Price $5.

Wartime influences are reflected in pages of the SAE Handbook, just off the press. New features include: specifications for coolant hoses; pipe thread standards; spring lock washer standards; nomenclature for pistons and piston rings; and standards for tractor power take-off and drawbar-hitches. Revisions include natural and synthetic rubber; steel hardness conversion numbers; specifications for non-ferrous metals.

* * *

Suggested Shop Problems. Metalcrafts Guild. 104 pages.

An illustrated practical shop manual containing 60 projects, 78 blue prints and other data. Convenient for home, shop and class. Illustrations cover 100 hand tools, bench and floor machinery and blue print reading.

* * *

Cumulative Index. Chemical Publishing Company. 164 pages. Price $4.

This comprehensive index covers Volumes I, II, III, IV, V and VI of the Chemical Formulary by H. Bennett. It goes right to the point without frills and offers at a glance volume and page number for each subject. Material has been arranged in strict alphabetical order with numerous cross references.

* * *

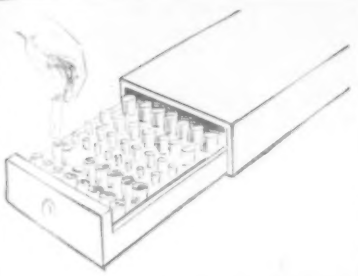
Mechanics Vest Pocket Reference Bock. Ziff-Davis Publishing Company. 214 pages. Price $1.25.

Rights to the familiar Mechanics Vest Pocket Reference Book have been acquired by Ziff-Davis Company, which is publishing a corrected edition. The handbook includes a table of all six natural trigonometric functions to five decimal places, with an added logarithmic table for ease in interpolation. Other tabular matter is included.

THE END

INFORMATION FREE

To receive the booklets listed in this section, list the key number found on the heading of the desired literature and your name and address on the postcard coupons—page 163.



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PRECISION PIN SETS

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Drill Sizes 1 to 60	Drill Sizes A to Z

(86 pins all in one cabinet)

FRACTIONALS 1/64" to 1" in increments of 1/64"
(64 pins all in one cabinet)

Highest quality hardened gage steel, ground to utmost precision, and UPPCO-Lapped for enduring accuracy. Tolerances to individual specifications. Number, letter or fraction behind each gage in clear white on metal strip. Handsome, durable walnut-finished cabinets 9⅞" x 15½" x 4½" deep. Wire or write. When asking prices, ***specify tolerances.***

Mfrs. of DUBLIFE Reversible Plug Gages and others of A. G. Design.

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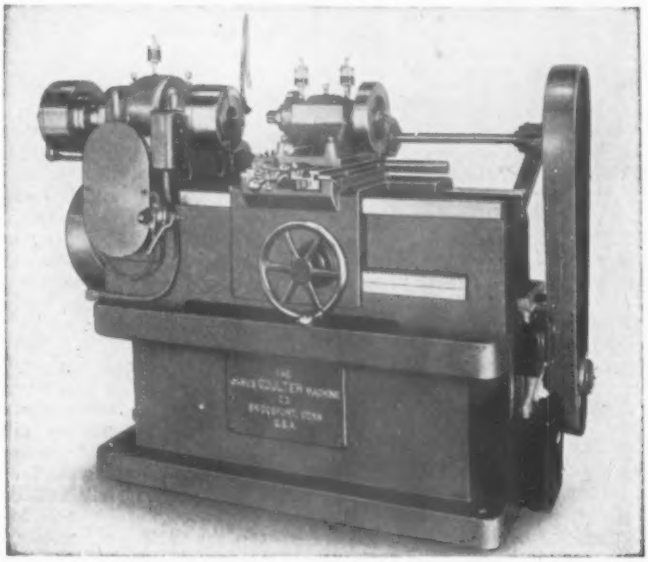
FULL AUTOMATIC CONTROL



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COMPLETE MOTOR EQUIPMENT — FIXTURE TO SUIT

The James COULTER Machine Co.
BRIDGEPORT • CONNECTICUT • U. S. A.

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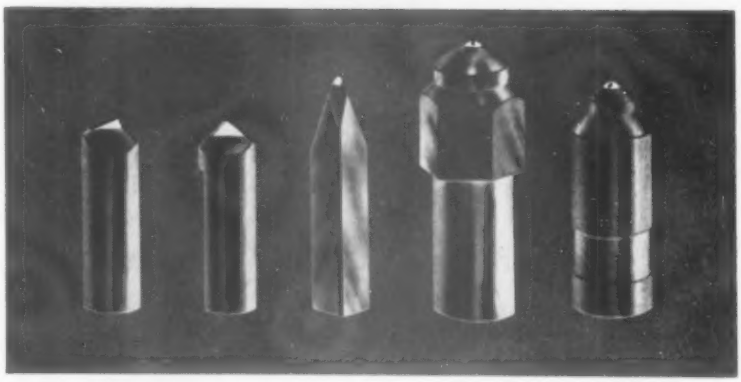

FOR EVERY INDUSTRIAL REQUIREMENT

● Wheel Dressing Tools — carefully selected, hard, sound diamonds — expertly mounted to withstand the rigors and hard knocks of today's increased production schedules.

● "DIATIPT" Shaped Diamond Cutting Tools for precision turning and boring. Unexcelled for machining bearing metals, copper, aluminum, hard rubber, Bakelite, celluloid and other abrasive materials.

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HANDY ANDY *Says*—

T.M. REG. BY THE BRAMSON PUBLISHING COMPANY

WRITING as a rocking chair expert late in '39, I predicted that the war would last five years, with the U. S. A. intervening and largely deciding the issue. And at date of writing (Sept. 12) V-Day in Europe seems imminent—in fact, Germany may collapse before this reaches the readers. Here's hoping!

Japan, of course, is something else again; there, I guessed wrong, opined that the Japs wouldn't care to tangle with Uncle Sam. (By now, they probably wish they hadn't.)

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But, from a psychological viewpoint, it was in the cards. For, of all the warring nations, the United States and Japan are unique in that, so far, neither has lost a war, and, the bad man of the East must needs challenge the strong man of the West. And now, Japan will Fall; the Nip pitcher went once too often to the well.

Through the gale of political verbosity that disturbs the domestic scene, my keenly attuned ear catches deep rumblings from the New Dealers that the G. O. P. and Hitler are in cahoots, that it's all a dark plot so that Germany will fold up just ahead of the fall election.

Then, we can swap horses two thirds across instead of in the middle of the creek, with Dewey riding into camp. As for Hitler, he gets hunk on F. D. R. by putting a crimp in the Roosevelt dynasty. Ain't politics awful!

▼ ▼ ▼

At that, the paperhanger from Wien threw a lot o'gears into reverse. F'rinstance, time was when salesmen, dropping in, would hand me cigars; now, they'll likely as not bum me for one. Only, my six for two bits favorites have crashed high sassiety at 28c straight, masquerading under new labels so as to top the OPA ceiling.

As for cigarettes, I've renewed acquaintance with Milo, Fatima, Helmar and Melachrino, besides trying out unknowns with a cough in every carton. Wonder what became of Cubebs?

Lately, I've been eyeing the wife's rattan rocker. Hot smoking, but it draws well. Broke in on rattan, as a boy, but got caught and had both ends warmed. However, this soy bean butter isn't bad—as a spread, I mean, not a smoke. But, who knows?—maybe the Squire of Dearborn, who made America soy bean conscious, may have ideas about the hulls. Hey, hullabulla-bullabull! Sold to the Ersatz Tobacco Company!

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What particularly worries me, in view of the coming Semi-Annual, is the shortage of liquor. I go on a synthetic bender at every Convention—in fact, I had two drinks in Indianapolis (George Goodson's treat) and two cocktails in Philly besides the shot o' Scotch Ray Morris treated on. And to think, I refused the third drink when up in Hamilton! Never make that mistake again!

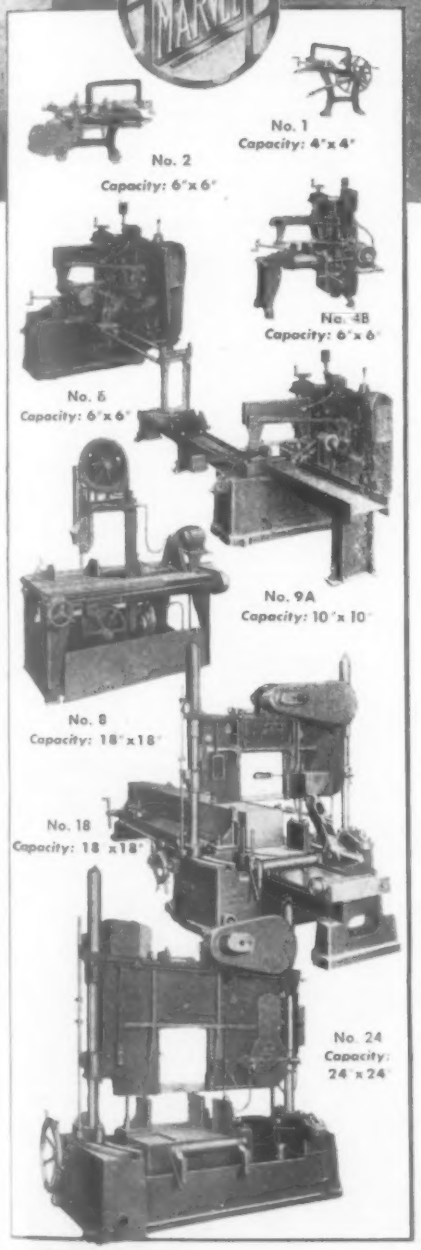
But then, I'm pretty well fixed, still have half of the four-fifths a vendor presented me with last Christmas. So, if any of you boys drop in for a visit I can extend true Scotch hospitality—that is, as long as the supply lasts. Or would you rather have grape juice?

▼ ▼ ▼

It's that way with everything. F'rexample, I bought some 2 x 4s, intending to add a room up in the attic a/c I've acquired another gun and my den's getting cramped. What I got wasn't just green; it was alive when delivered and writhed and twisted in dying agony. Then, when rigor mortis set it, it assumed every shape from a corkscrew to a French scroll. And it cost me $120 per M.

But, up in Canada, an acquaintance

(Concluded on page 196)



The No. 8 MARVEL Band Saw does the "Impossible"

This "impossible" job required the cutting into 12 equal sections of a cast steel ring 42" in diameter. The ring was to be an expanding chuck for stretching and sizing automobile tire rims. Each ring weighed 750 pounds, the length of the cut was 15" and the thickness of the material at the hub was over a foot in thickness. The sectioning of this ring with ordinary equipment was "impossible" because of the high cost involved and the special handling fixtures needed.

The Chicago Gear Mfg. Company, with several MARVEL Saws, including a No. 8 Band Saw, could take this job because they knew that with the Universal MARVEL No. 8 and its broad planer-type bed no special setting-up fixtures or tools would be necessary and that their regular saw operator could service the machine without interfering with his regular work.

The MARVEL No. 8 handles all work up to 18" x 18" cross section and does cutting-off, mitering and notching. The blade feeds into the work at any angle from 45° right to 45° left. It is the most versatile metal-cutting saw built.

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Eastern Sales Office: 225 Lafayette St., New York 12, N. Y.

MARVEL SAWS

—HANDY ANDY SAYS—

(Concluded from page 194)

built himself a summer cottage of good, honest pine at $60 per M—just what we used to pay for the real goods. Which reminds me! I see by the papers where Premier Geo. A. Drew, of Toronto, says Canada needs more people. Hope she gets 'em, and of the same kind we've got in the A. S. T. E. They're swell folks!

At that, we've not suffered overly, except as we've put up with minor annoyances and OPA inconsistencies. Of essentials, the most of us have had enough, and we've been able to share with the destitute and homeless, the unfortunates of Europe and Asia. And truly, it has been more blessed to give than to receive, as, no doubt, we may have to keep on giving, perhaps for a generation.

▼ ▼ ▼

For, this is America, at once a land of boundless waste and equally boundless generosity, of rugged individualism and driving energy yet of tenderest mercy.

And now, we are emerging as the ranking power in the modern world; now, truly, may tyranny tremble at Columbia's mandates! May we use our strength wisely, that we may be a force for internal harmony and progress as well as for world peace.

Oh well, I'm not going to get overly serious, this time. If anything, I'd like to forget the worries of the day and just hobnob with old friends. In this connection, I drove out to O. B. Jones farm—uh, ranch, I mean—last Sunday. Found O. B. six feet down in a well he was digging under his barn, clay from head to foot.

▼ ▼ ▼

He's got cattle, pigs, chickens, turkeys, hounds and guns—oodles of guns!—and hills and valleys 'n' all the appurtenances of a country gentleman including a fine wife. That's what I want (the rural scene, I mean; I've got the fine wife), along with a pony for the Cyclone (that's my granddaughter) and three goats. Goats, believe it or not, make the finest pets on earth, besides, you can milk 'em if they're that gender, and if you know how to milk.

But then, that's getting into postwar planning, and as aforesaid, I'm shying away from heavy thinking. Instead, I'm looking ahead to meeting old friends in Syracuse, although attendance may be somewhat thin a/c travelling conditions. Me, I'm planning to walk part of the way, having read something by Bernarr MacFadden that hiking develops the thumb. You waggle it, and somebody gives you a ride maybe.

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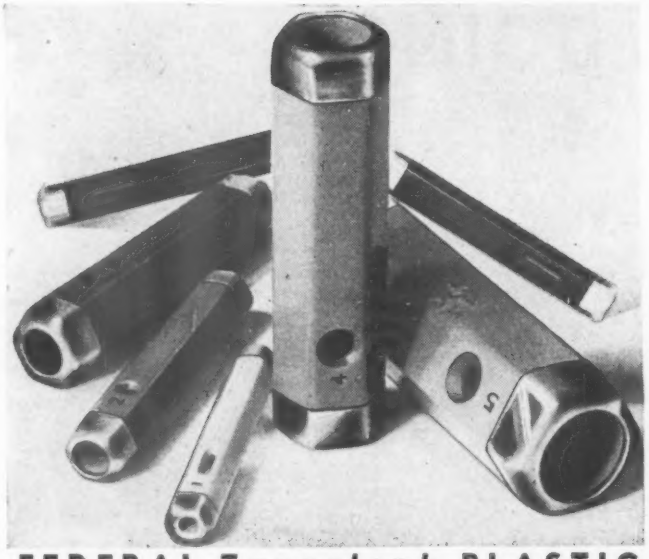
Anyway, I'll get to Syracuse somehow, and when the Convention is over I'll tell you all about it. Then, when the summer's diversions are done with, I may settle down to serious themes; right now, my thoughts stray to the fall chores out in the garden. Got to get the lawn reseeded while there's still a chance to get the benefit of the fall rains. We'll compare notes on crab grass when we meet.

THE END



FEDERAL *Taperlock* PLASTIC GAGE HANDLES

Made in durable plastic to accepted standard dimension, they are tough and long-lasting. ¶ Light in weight—one-third lighter than aluminum—a feature that permits the sensitive "touch" so necessary in close tolerance gaging. ¶ Ideal for glass gages because their light weight reduces the danger of chipping and breaking when dropped. ¶ They are easily marked for identification with the same stamps and tools used for marking handles of other materials. ¶ Federal Plastic Gage Handles possess insulating properties that protect gages from bodily heat that might affect accuracy. ¶ SEVEN SIZES—00-0-1-2-3-4-5. ¶ FOUR COLORS—Red, Yellow, Green, Black.

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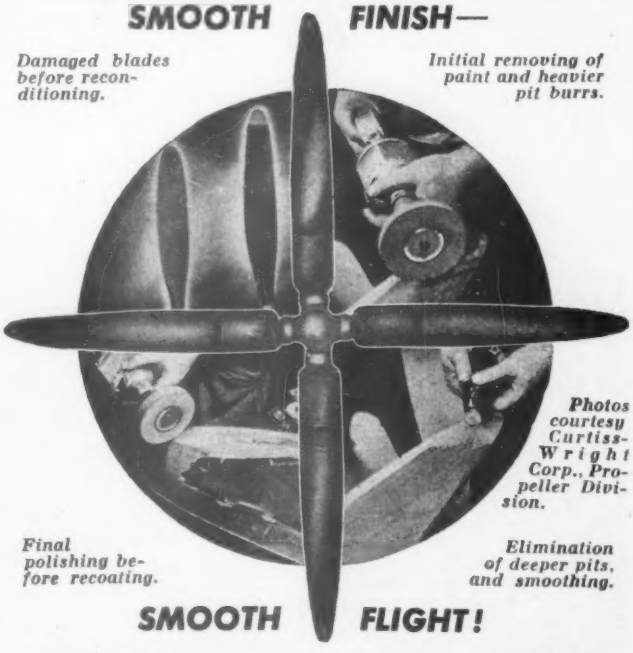

Photos courtesy Curtiss-Wright Corp., Propeller Division.

Final polishing before recoating.

Elimination of deeper pits, and smoothing.

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A. S. T. E. DOINGS

• National A.S.T.E. Headquarters: 2567 W. Grand Blvd., Detroit 8, Mich. Telephone TYler 5-0145. National Officers: (1944-45 term): President, D. D. Burnside; 1st Vice-President, C. V. Briner; 2nd Vice-President, A. M. Sargent; 3rd Vice-President, W. B. Peirce; Secretary, E. V. Johnson; Treasurer, F. W. Eaton; Assistant Secretary-Treasurer, L. G. Singer; Executive Secretary, A. L. Potter.

• For application blanks and information pertaining to membership in the American Society of Tool Engineers, address the Secretary's office, 2567 West Grand Boulevard, Detroit 8, Michigan.
• Senior initiation fee is five dollars. Dues eight dollars per year for senior grade membership and five dollars per year for junior grade membership. Junior initiation fee is two dollars.

• **St. Louis**—"Local Talent" supplied speakers for the September 7 meeting. A yearly feature at St. Louis, the chapter drew its speakers from membership. Those who participated included D. D. Burnside, American Stove Company and National A. S. T. E. President, A. C. Krus, U. S Cartridge Company, and Clarence L. Miller, Measuregraph Company.

• **Rockford**—A. M. Johnson, Barnes Drill Company, was coffee speaker at the September 7 meeting. He was followed by H. T. Johnson, General Motors Corporation, who talked on "Usage and Maintenance of Machine Tools." Movies and slides were used to illustrate.

• **Springfield (Vt.)** — Twin States Chapter gathered September 13 to hear "The Tool Engineer's Place in Our Post War De elopment", delivered by Arthur A. Merry, Pratt & Whitney Aircraft.

• **Louisville**—L. E. Mehlhope, Cincinnati Milling Machine Company, was technical speaker September 12 attended by 100. He discussed "Centerless Grinding".

• **Elmira**—"Precision Measurement" was title of a talk given by M. A. Singer, Continental Machines, Inc., at the September 11 session of Elmira Chapter. Slides and descriptive charts were employed to augment the discussion.

• **Wichita** — Fifty chapter members met September 12 at the superfortress plant of Boeing Airplane Company. They had dinner at the factory cafeteria and spent three hours in a tour of the production and tool departments.

• **South Bend**—Chapter 30 played host to plant executives at their September 12 meeting. Executives who accepted the invitation were introduced in a special ceremony before the speaker of the evening, Louis C. Upton, President, 1900 Corporation, gave his talk on "Hidden Values".

• **Toronto**—W. T. Muirhead, A. C. Wickman (Canada), Ltd., was speaker at the September 8 session. He spoke on "Tools of Today for the Jobs of Tomorrow".

• **Windsor**—Windsor Chapter 55 met September 11 in a joint session with the Independent Association of Industrial Electricians. Attendance was 122. Speaker of the evening was W. Gordon Clarkson, Canadian Westinghouse Company, Ltd., on the subject "Electronics". His talk was illustrated. He was introduced by R. L. Bovart, Westinghouse District Manager. A talking film, "Electronics at Work" was shown.

• **Columbus**—War thrills were in order at the September 12 meeting of the Columbus Chapter. Lieut. R. F. Bicher, Army Air Forces, presented a restricted movie on air combat and then told his experiences in 27 missions over enemy territory. He was shot down over Austria. The chapter discussed making a bid for the 1945 Semi-Annual A. S. T. E. meeting at the Syracuse convention.

• **Indianapolis** — H. A. Frommelt, Kearney & Trecker Manufacturing Company, opened the season with an address on "Carbide Steel Milling" at the September 7 meeting. His talk was illustrated with slides. At the October 5 meet, A. J. Langhammer, Chrysler Corporation, gave a talk on "Latest Advances in Making Parts from Powdered Metal".

• **Hamilton**—John C. Howell, Worthington Pump and Machinery Corporation, Ltd., looked into the future in the talk "Business After the War and How It Affects Tool Engineers" at the September 8 meeting. He was optimistic in outlining work to be done. The meeting attracted 80.

• • •

Wallace B. Kennedy

Wallace B. Kennedy has received the Exceptional Civilian Service Award from the War Department for outstanding work on tool engineering design and conservation of strategic materials. Kennedy is Superintendent of Production at the Watertown, Mass., Arsenal and a member of Boston Chapter 33 A. S. T. E.

Importance of the award is emphasized by the fact that fewer than 100 such awards have been made among hundreds of thousands of civilian employees of the War Department.

Kennedy was gadget speaker at the Boston Chapter's April meeting and the subject of his talk was published in the Tool Engineer in the Crib as two items, "Chip Breaker for Carbide Tools" and "Grinding Fixture for Carbide Tools".

• **Akron**—Akron Chapter inaugurated its winter season by exploring the subject of graphite steels. Their speaker was Frederick R. Bonte, Timken Roller Bearing Company. He spoke on "Process and Use of Graphite Steel for Special Punch and Die Problems".

• **Newark**— Northern New Jersey Chapter opened its winter sessions September 12 with an address by L. Lingler, Sheffield Corporation. Topic was "Dimensional Control".

• **Fort Wayne**—Dr. Derso Shybekay, Purdue University, was coffee speaker at the September 13 meeting. He chose as his topic, "What Now?" A former editor of a German newspaper, Dr. Shybekay outlined problems of a defeated Germany. The technical session highlighted the speech of Einar Almdale, Carboloy Corporation, who chose as his subject, "Tungsten Carbide—New Applications and Development for Milling Steel".

• **Milwaukee**—"Get Together Night" was theme for the September 14 meeting at which A. J. Langhammer, Chrysler Corporation, presented the first paper of the season. His title was, "Powdered Metallurgy of Oilite and Other Metal". Second speaker was Attorney C. Young, who spoke on, "Fundamentals of Patents for the Tool Engineer".

• **Springfield (Mass.)** — Waldemar Naujoks, Steel Improvement & Forge Company, spoke on, "War and Postwar Forgings" at the September 11 meeting.

• **Cleveland**—Cleveland Chapter turned out 500 to hear Fred Whitcomb, Motor Products Corporation, discuss "Deep Freezing of Metals". The Cleveland members were feted by the Cleveland Chapter of SAE at a dinner in September. Speaker at this meeting was Lt. Col. G. B. Jarrett, U. S. Army, who talked on, "Enemy Materiel".

• **Fond du Lac**—A technical session featuring a talk by Louis Lingler, Sheffield Corporation, "Methods and Means to Maintain Those Extra Close Tolerances with Latest Design Precision Instruments", was held September 8.

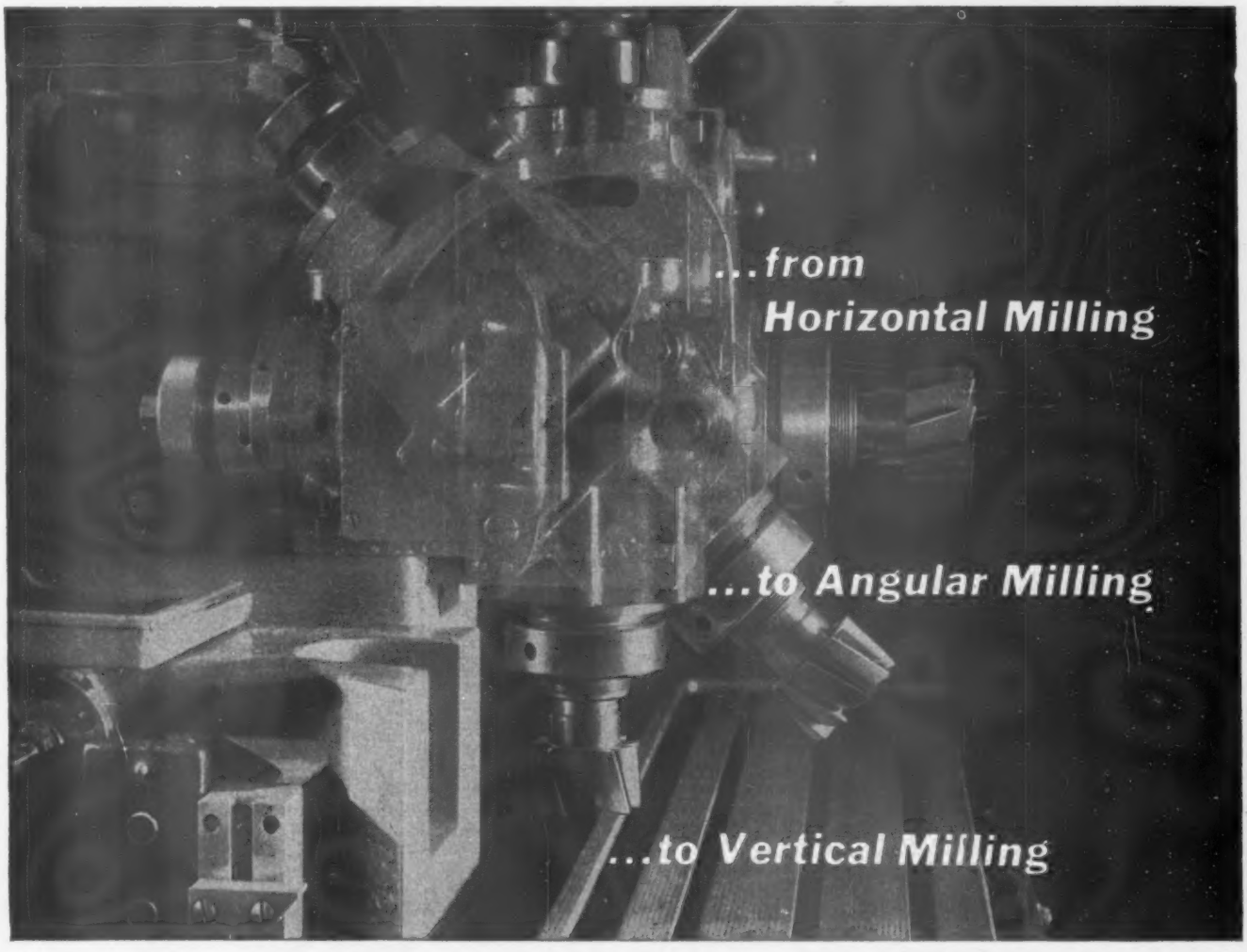
• **Binghamton**— Ernest V. Flanders, Jones & Lamson Machine Company, gave a blackboard illustrated talk on thread grinding with multiple form wheels, which make a complete thread form with one pass of the wheel.

• **Worcester**—S. D. Fendley, General Electric Company, introduced "The Versatile Electronic Drive" to Worcester members and demonstrated his talk with a Thy-Mo-Trol motor.

(Continued on page 202)

Quick Changes on Van Norman

RAM-TYPE MILLING MACHINES



When the operator has completed a horizontal cut on a Van Norman Ram-Type Miller, and wishes to proceed to an angular or vertical cut . . . *he does not need to touch the set-up on the table.* All he has to do is unclamp the swiveling cutterhead, swing it to the required position, reclamp . . . *and start the next cut.* Only a matter of moments, compared with the time needed to reset the work. And one of the greatest sources of errors is completely avoided. This exceptional ease and convenience of operation provide gains in time, accuracy and output. So today, throughout America's war industries, Van Norman Ram-Type Millers are delivering the goods in great plenty . . . and in plenty of time.

VAN NORMAN
Company

ARMY E NAVY

SPRINGFIELD 7, MASSACHUSETTS

● **Pittsburgh**—Praise for the production and tool engineer was handed out by Lt. Col. Downey, Pittsburgh Ordnance District Chief, at the initial fall meeting September 9.

● **Cincinnati**— Meeting jointly with American Society for Metals, Cincinnati Chapter opened its winter season by hearing two speakers. Charles I. Kraus, Stewart Warner Corporation, spoke on "New Developments in Centralized Lubrication and New Methods in Lubrication Procedures". W. J. McTighe, Wright Aeronautical Corporation, chose as his subject bearings and discussed chemical and mechanical composition.

● **Rochester**—The September 14 meeting introduced members to R. H. Koehring, Moraine Products Division, General Motors Corporation. Koehring spoke on "Powder Metallurgy" before 100.

● **North Kansas City**—A round table discussion by chapter members filled out the program when the guest speaker was taken ill during his speech at the September 12 meeting.

● **Atlanta**—Encouraged by record-breaking attendance at their September meeting, Atlanta scored again in their October 4 session. Principal speaker was Fred Williamson, Bell Aircraft Corporation, who delivered a paper on "Plastics in Industry". He is Assistant Superintendent of the Bell Experimental Department.

● **Dallas**—North Texas Chapter held a joint meeting with the American Society for Metals to hear A. H. d'Arcambal, Pratt & Whitney, speak on, "Cutting Tools—Their Design, Materials and Treatment". d'Arcambal is a former National President of A. S. T. E.

● **Chicago** — Guest Speaker Clifford Ives, Ives Engineering and Planning Company, reviewed problems of post-war engineering, planning and tooling for 130 members and guests at the September 11 meeting. He illustrated his talk with slides. Charles C. Henry, Chicago Die Mold Manufacturing Company, delivered the principal talk, "Properties, Methods and Cost of Post-war Plastic Products", at the October 2 session of the chapter.

● **Philadelphia**—Philadelphia Chapter explored possibilities of deep freezing with Fred W. Whitcomb, Deepfreeze Division, Motor Products Corporation, who spoke to them September 21 on the subject, "Why Minus 120° Is Important in Every Manufacturing Plant." Attendance was excellent.

● **Syracuse**—"Usage and Maintenance of Commercial Diamonds" provided the title of a technical discussion by I. E. Rifkin at the September 12 meeting.

● **Detroit**— Chief Engineer John A. Harrington, Continental Machines, was principal speaker at the September 14 meeting of Detroit Chapter. He spoke on "Dimensional, Quality and Gage Control". A. N. Goddard, Board Member, Engineering Society of Detroit, complimented the Chapter on its affiliation with the E. S. D.

● **Toledo**— "Induction Heating" was topic of an address delivered by Dr. Harry B. Osborn, Jr. at the September 13 meeting. Dr. Osborn represents Tocco Division. The meeting was attended by 135.

● **San Diego**— Tooling methods employed by Rohr Aircraft Company to meet war demands were described by Fred Rohr to 135 members and guests September 15. He detailed methods of absorbing changes without disrupting production.

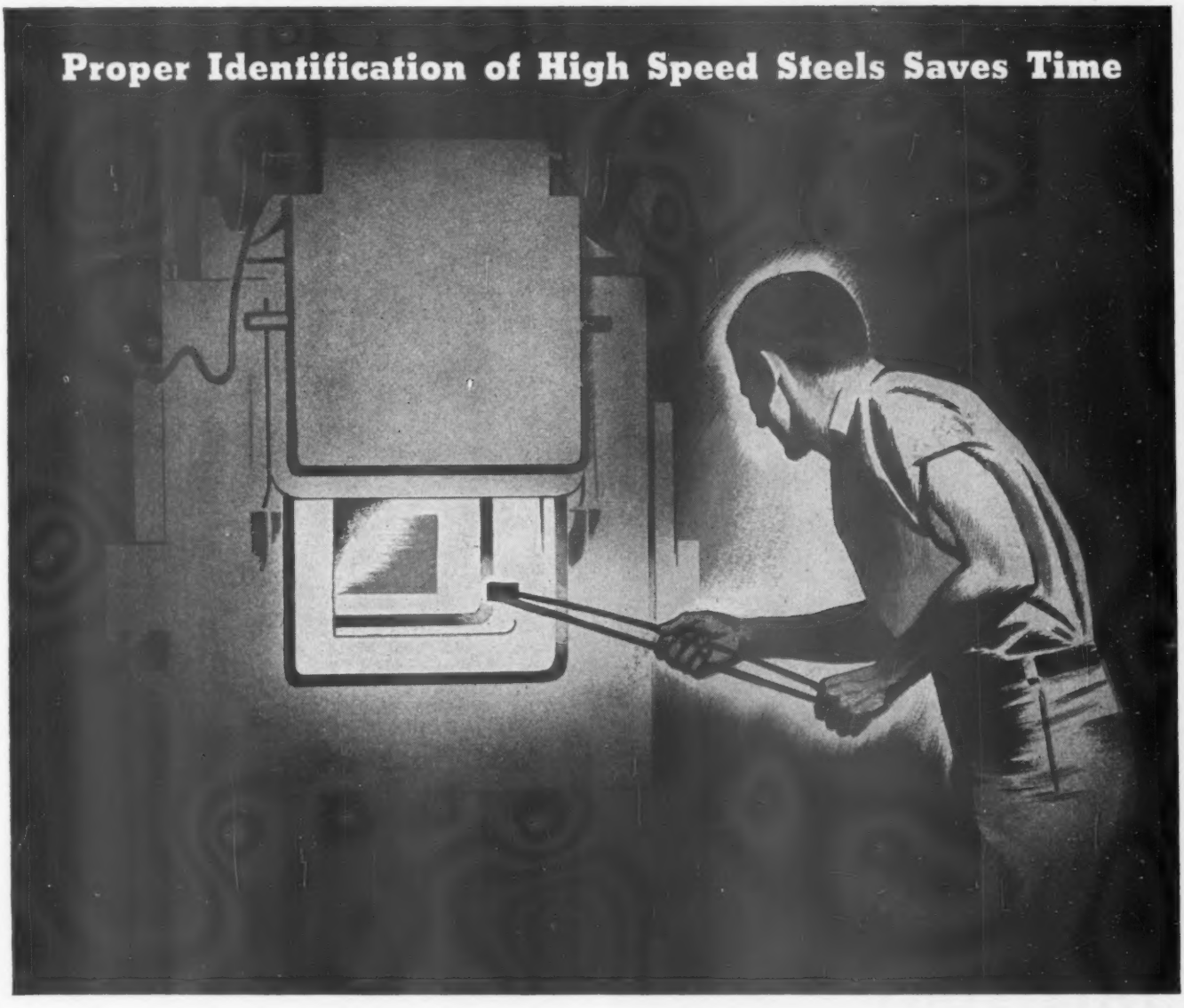
● **Boston**—Seventy five members and guests braved hurricane warnings to attend the September 15 meeting to hear W. J. Conley, Lincoln Electric Company, speak on "Welding of Jigs and Fixtures". He detailed his address with blackboard and slide diagrams and photos.

● **Providence**—Training and rehabilitation of returned war veterans was subject of a talk by Col. Davis G. Arnold, Veteran's Administration, at Little Rhody Chapter's September 20 meeting.

● **Decatur**—Opening the winter season at Decatur, Charles A. Dassing, Bakelite Corporation, discussed "Plastic Materials and Their Uses".

(Continued on page 204)

Proper Identification of High Speed Steels Saves Time



Plants using both tungsten and molybdenum types of high speed steels should give serious consideration to the establishment of an efficient identification system—one that will keep the steels separated from bar stock to finished tool.

The danger of spoilage is particularly acute when mixed lots get into the heat treaters' hands.

The recommended hardening temperatures for tungsten types are 100° to 200°F. higher than those for the molybdenum types. Treating the latter so far above recommended temperatures will spoil them for cutting tool service. Treating the tungsten types that far below recommended hardening temperatures will not develop the required red hardness.

Heat treaters sometimes use the "sweating" of tungsten types as an indication that the steel is up to proper hardening temperature. *THIS DOES NOT HOLD WITH MOLYBDENUM TYPES.* In their case, a pyrometer should always be used to determine when the steel is at the recommended hardening temperature.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

ARMY E NAVY

MOLYBDIC OXIDE, BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

Climax Molybdenum Company

500 Fifth Avenue · New York City

MOLY

—A. S. T. E. DOINGS—

● **Minneapolis**— Twin Cities Chapter served dinner to 60 and then had an additional 25 at the technical session which followed. "Heat Treating Hints", a film, was shown in conjunction with a talk by R. B. Seger, Lindberg Steel Treating Company.

● **Tri-Cities**—Tri-Cities Chapter started the 1944-45 season by attending an illustrated technical talk by Dr. H. A. Frommelts, Kearney and Trecker Milling Machine Company. The title was, "Development of Equipment for Negative Angle Milling with Carbide Tools". The coffee talk was delivered on "Patents" by Attorney A. G. Bush.

● **Seattle**—Seattle Chapter turned to Forrest Johnson, Boeing Aircraft, to answer the questions on "Job Evaluation and Management", at their August meeting. Richard S. Weston, Chapter member, spoke on "Postwar Conversion".

● **Toledo**—Toledo Chapter heard Dr. Harry B. Osborn, Jr., Ohio Crankshaft Company, discuss "Induction Heating" at their September 13 meet.

● **Schenectady** — The Schenectady Chapter enjoyed a social evening September 14.

● **Williamsport**—Former A. S. T. E. National President Otto C. Winter was speaker at the September 11 meeting.

● **Peoria** — Peoria's September 13 meeting attracted 450 members and guests to dinner and an additional 50 to the technical session which followed. Speaker was Bill Jack, President, Jack & Heintz, Inc., who spoke on the subject, "Humanism in Industry". A film was also shown.

● **Los Angeles**—James H. Spade, Allegheny Ludlum Steel Corporation, spoke at the September 14 meeting which drew 175 members and guests. His topic was "Hardenability of Steel".

● **Potomac**.— G. Edward Pendray, Westinghouse Electric and Manufacturing Company, was speaker at the October 5 meeting of Potomac Chapter. His subject was "Rocket and Jet Propulsion".

● **Niagara District**— C. W. Jinnette, Norton Company, was speaker at the September 22 meeting at St. Catherines. He spoke on "Norbide for Precision Gages". Jinnette pioneered use of boron carbide for gages and his talk dealt with various gage applications.

Coming Meetings

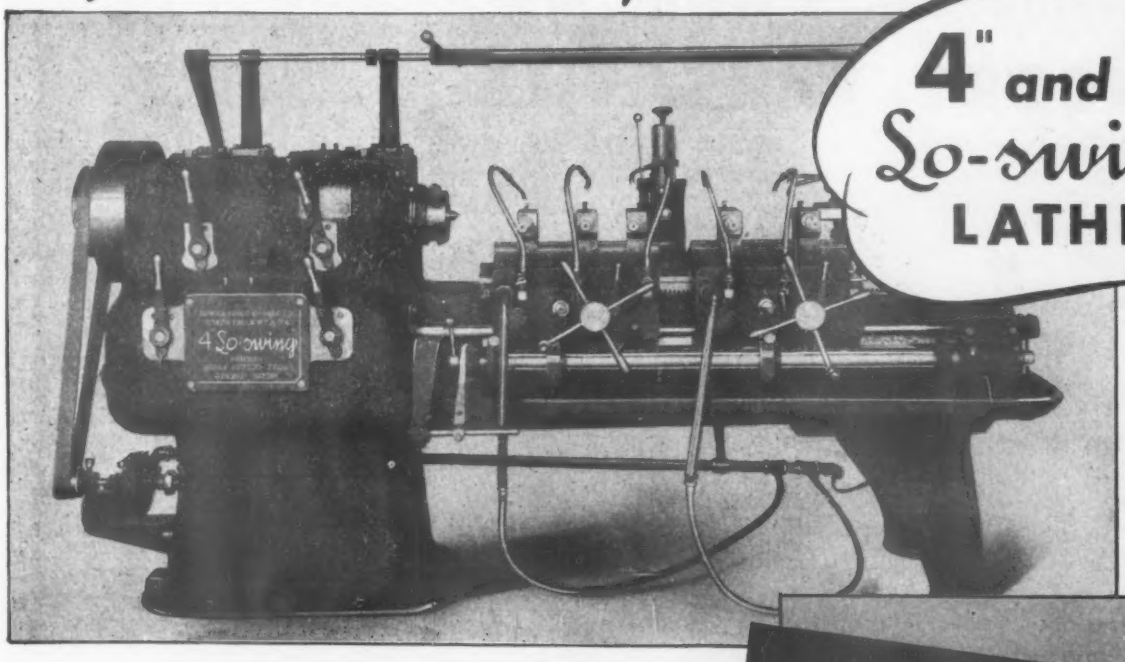
Rockford—October 7, closed meeting. Members will visit Barnes Ordnance Plant.

Portland (Me.)—October 15, Lafayette Hotel. Speaker will be Col. W. G. Night, U. S. Army Retired, on subject "Military Railways of the U S. Army".

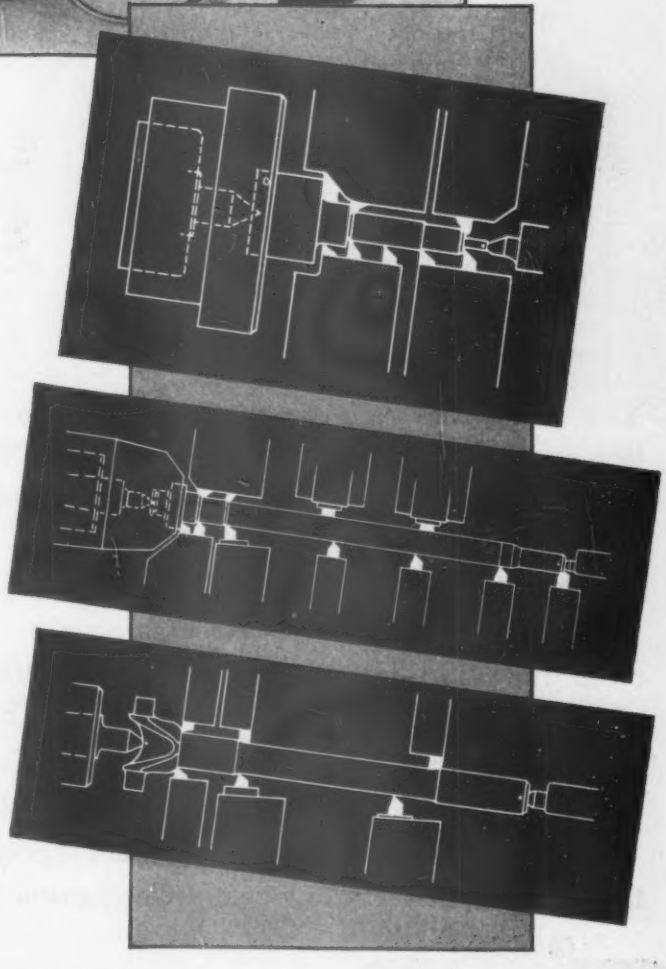
(Continued on page 206)

A PROVEN SHAFT TURNING MACHINE

For the small plant



4" and 8" Lo-swing LATHES



● If you have shaft or similar work to turn, in small lots, this proven multiple-tool lathe will help solve your problems. It has an enviable record for accurate, low-cost production.

4″ & 8″ Lo-swing Lathes, in standard lengths, are particularly suited for the rapid turning of shafts up to 8-inch diameter by 132-inch length. Routine operations include turning several diameters, both straight and taper, squaring shoulders, necking for grinding and making form cuts. Power operated tools on a rear carriage are provided when necessary.

Adequate equipment for all ordinary work is available in standard accessories. For large lot production special tooling can be furnished to further increase production economies. Regardless of how complicated the tooling, the Lo-swing is quickly set up for different jobs. 4″ & 8″ Lo-swing Lathes are now available for quick delivery under Priority Regulation No. 24.

SENECA FALLS MACHINE CO., SENECA FALLS, N. Y.

LATHE NEWS *from* SENECA FALLS

—A. S. T. E. DOINGS—

Hamilton—October 13, Kerby House, Brantford. Speaker is to be H. J. Stagg, Crucible Steel Company of America. His subject will be "Proper and Improper Design of Tools and Dies".

Boston—October 12, Schrafft's Restaurant. P. A Miller, Tubular Rivet and Stud Company, will speak on "Powder Metallurgy". Film showing manufacture of tungsten carbide will be shown.

Buffalo-Niagara—October 19, Trap & Field Club. J. L. Yates, Worthington Pump Machine Company, will speak on "Diesel Engine Manufacture".

San Diego— October 23, San Diego Woman's Club House. Speakers will be John W. Kinsey, Micromatic Hone Corporation, on the subject "Micromatic Honing" and Major Jordan, USMC, who will discuss "Aviation Ordnance".

Rochester—October 12, Lower Strong Auditorium. J. H. Stimson, Greenfield Tap and Die Company, will give a paper on "Screw Threads and Screw Thread Problems".

Fort Wayne—October 11, Chamber of Commerce Bldg. W. R. Caple, Dow Chemical Company, will speak on "Magnesium in the Making and Its Many Applications". The address will be supplemented with two films.

Twin Cities— October 18, Covered Wagon Cafe.

Detroit—October 19, Rackham Building.

Niagara District—November 3, annual dancing party, The Welland House.

Chicago—November 6, speaker will be George H. Sanborn, Fellows Gear Shaper Company, on the subject "Gears at War". The talk will be supplemented with films.

Philadelphia—October 19. Technical talk, "Modern Broaching".

Milwaukee—October 12, Astor Hotel. Speakers will be Ray Buettner, William Sievert and Lester Birbaum, Milwaukee Stamping Company.

Northern New Jersey— October 10, George K. Scribner, Boonton Moulding Company, will speak on "Shape of Things to Come".

Toledo—October 11, Speaker will be Bill Jack of Jack & Heintz.

Schenectady—October 12. Topic will be, "Tool Design for Production."

●CORRECTION

The editors of The TOOL ENGINEER regret an error in reporting appointment of Charles J. Hasse as Office Manager of the A. S. T. E. His name appeared correctly in text of the story but was erroneously spelled in a caption under the picture. THE END

HARDINGE Second Operation Machines mean better results without expensive tooling

For precision second operation work, the trend is to Hardinge. The initial low cost, the versatility and unusual capacity, without the set-up complications involved with large machines, created an ever-increasing demand for these machines.

The double tool cross slide and turret take standard tooling. The six-position tilted turret has an automatic indexing and locking head with six independent travel stops.

The illustration shows one of the groups of Hardinge Second Operation Machines in the production of precision aircraft parts at Moore & Steele, Owego, N. Y.

Specifications: 1" collet capacity, 6 " step chuck capacity, 5" jaw chuck capacity, 9" swing, eight spindle speeds up to 4000 r.p.m.

HARDINGE BROTHERS, INC.
ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

THE PASSING PARADE

THE EVER-CHANGING SCENE IN MASS MANUFACTURING

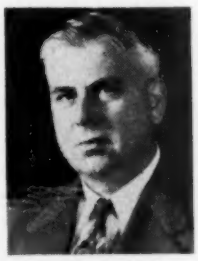
Radio Receiver—Decision of Westinghouse to manufacture a home radio receiver line brought appointment of Harold W. Schaefer as Assistant Manager in the newly-formed Radio Receiver Division. Selection was announced by Walter Evans, Vice President. Schaefer will direct engineering and production and will report to Harold B. Donley, Division Manager. Schaefer studied at Lewis Institute and University of Chicago.

Science Writers—John Steel, writer and electronics engineer, has joined the staff of Florez, Phillips and Clark, Detroit marketing agency. He will handle accounts requiring specialized electrical or mechanical knowledge. John T. Nevill, Detroit news and advertising writer for 24 years, has also been appointed to the firm's staff. Announcements were made by L. A. Clark, General Manager.

Camera Expert—Joseph A. Idank has joined the staff of Sherman and Associates and has been assigned to Fairchild Camera and Instrument Corporation. He was formerly Chief Designing Engineer at Ansco's New York Postwar Camera Division.

Official Honored—Election of Reginald W. Porter, Treasurer of the Van Norman Company, to membership is announced by Controllers Institute of America.

Two Promotions—Osborn Manufacturing Company announces promotion of two officials. Ralph H. Hisey, 30 years an Osborn employee, has been appointed Vice President in charge of Manufacturing and Engineering for both Brush and Machine Divisions.



Ralph H. Hisey

Hugh M. Little

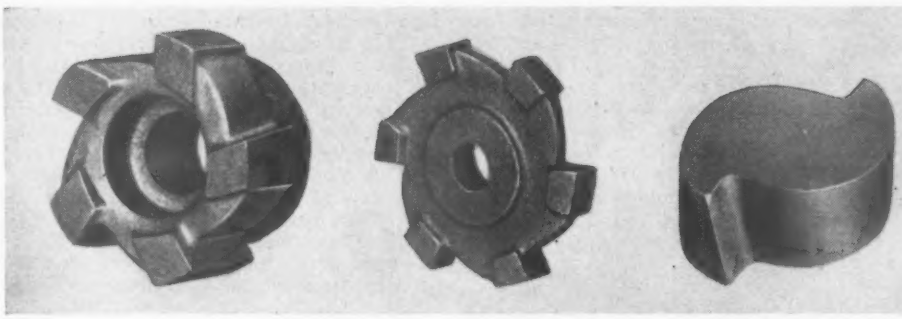
Hugh M. Little has been appointed Works Manager of both divisions. He was associated with the Ohio Crankshaft Company and American Bantam Car Company before joining Osborn.

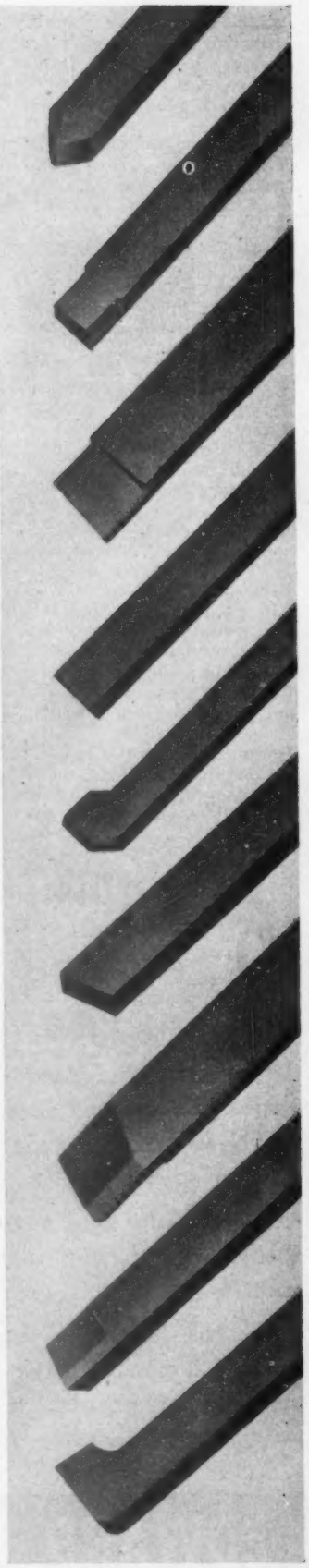
Joins Company—Widely known in the tool industry, Lieutenant Colonel V. A. Armstrong has returned to inactive status and has become associated with Cone Automatic Machine Company. Armstrong has been in the Machine Tool Section, Army & Navy Munitions Board.

Division Manager—Appointment of K. R. Van Tassel as manager of Industrial Control Division of General Electric's Industrial Divisions is announced by J. E. N. Hume, Commercial Vice President. Native of Geneva, N. Y., Van Tassel attended Hobart College and M. I. T.

New Executive—One-time Chrysler employee Fred R. Cooper has been named to the Executive Staff of Warren City Manufacturing Company, announces Raymond J. Fitness, Vice President of Operations. Cooper was formerly assistant to Joseph W. Frazer, Willys-Overland President, who was recently elected Chairman of the Graham-Paige Board. Warren City has become a wholly-owned subsidiary of Graham-Paige. Other important appointments include naming Fred O.

(Continued on page 212)





SPEED WORK OUTPUT

WITH

Cooper-Bessemer Tool Shanks

Tough Meehanite tool shanks, tipped with carbide, in most cases permit faster cutting than carbon steel tool shanks. Originally introduced early in the War to conserve carbon steels, these tool shanks continue rapidly to gain in popularity.

Meehanite doesn't load up as fast as carbon steel, dissipates heat faster, has greater capacity for damping vibration, requires less machining in the first place and can be ground faster.

All of these add up to faster cutting and faster all around production. In addition, Meehanite has a coefficient of expansion closer to that of carbide than steel's. Meehanite forming tools, milling cutters and special purpose tools also share these advantages.

Send for free samples, and test these tools in your own shop. Write for Bulletin 53 T-2 which lists standard sizes and prices. Special shapes available to fit your need.

THE Cooper-Bessemer CORPORATION

DEPT. E., MOUNT VERNON, OHIO

Kolberg as Works Manager, Harry D. Beutlich as Director of Industrial Relations, Norman S. Eastin as Supervisor of Costs and Procedures and Harry E. Johnson as General Accountant. R. J. Fitness, Vice President of Operations, announced appointment of Beutlich and Kolberg and Marvin J. Alef, Vice President and Secretary-Treasurer named Johnson and Eastin.

Engineer Advanced — Promotion of Frederick C. Knowles as Boron Carbide Engineer is announced by Norton Company. Knowles will make his headquarters at the Detroit Norton Warehouse.

Export Sales—Selection of Alexander S. Keller as a Niles-Bement-Pond Company vice president is announced by Charles W. Deeds, President. Keller will devote most of his time to export sales promotion.

Organize Firm— Former aeronautics men Frank C. Williams and George H. Tweney have teamed to form the firm of Williams and Tweney. They will do industrial designing. Williams is a former design executive for Stout Research Division, Consolidated Aircraft, and Tweney was associated with Pan-American Airways as maintenance and flight test engineer.

Engine Manager— Tulsa's Arch F. Campbell has been named Branch Manager of the Detroit Diesel Engine Division of General Motors. He will headquarter in Tulsa and handle distribution of engines to the petroleum industry.

Carburetor Man—Chief Engineer, Aircraft Carburetor Engineering Department, Bendix Products Division, is the new title for Henry G. Tarter, according to announcement of Malcolm P. Ferguson, Vice President and Group Executive of Bendix Aviation

Henry G. Tarter

E. F. Theis

Corporation. Tarter is a graduate of Oregon State College and Pennsylvania University. He has been active in development of the Bendix-Stromberg "injection carburetor", which is used on many allied planes.

Clutch President—E. F. Theis is new president of L. G. S. Spring Clutches Corporation. The firm has become a wholly-owned subsidiary of Curtiss-Wright Corporation, according to announcement of G. W. Vaughn, Curtiss-Wright President.

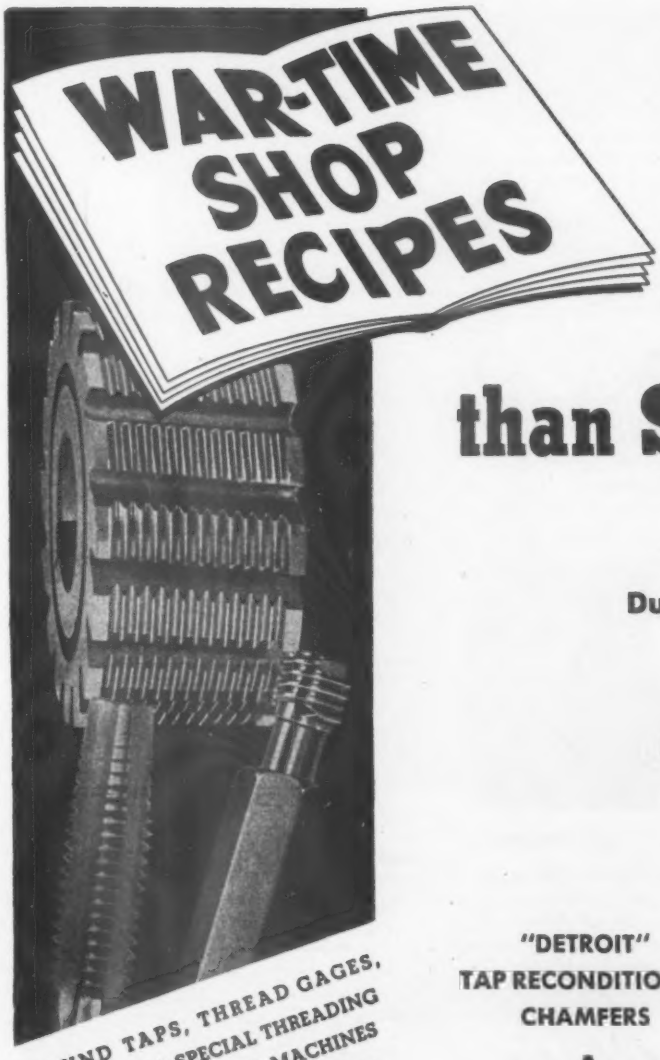
Advertising Man — Victor Ancona, formerly Executive Director of Visual Facts, has joined the advertising department of American Machine & Foundry Company. He was recently discharged from the Army. Besides his advertising duties he will serve as Graphics Consultant. He will be assisted by Pauline Surdock.

Air Executives—Appointment of Leonard S. Hobbs as Vice President for Engineering and Wright A. Parkins as Engineering Manager has been announced by Frederick B. Rentschler, Chairman, United Aircraft Corporation. Hobbs was also named member of the Operating & Policy Committee. He will coordinate engineering programs of the corporation's several divisions. A. V. D. Willgroos, Chief Engineer, Pratt & Whitney Aircraft Division, will continue to specialize on new power plants under Hobb's direction.

Tool Consultant— Pioneer developer of cobalt chromium steels, Victor F. J. Tlack has been named Consultant for Latrobe Electric Steel Company. He will also be Special Representative for the Sales Department. Tlack was formerly President of Darwin & Milner, Inc., having been associated with that company 30 years.

Board Member — Succeeding Gordon Lefebvre, resigned, George O. Desautels has been elected to National

(Continued on page 214)



GROUND TAPS, THREAD GAGES, THREAD HOBS & SPECIAL THREADING TOOLS. SPECIAL TAPPING MACHINES

DULL TAPS COST *MORE* than SHARP ONES

Dull taps wear out quicker
Dull taps increase scrap
Dull taps decrease thread accuracy

"DETROIT"
TAP RECONDITIONER
CHAMFERS
•
SPIRAL POINTS
•
POLISHES POINTS
•

The Detroit Tap Reconditioner makes it *easy* to keep taps sharp, quickly pays for itself, cuts tapping and tap costs.

The Detroit Tap Reconditioner puts you in a better position to meet tomorrow's stiff post-war competition.

Ask for Bulletin No. TRM-2

BUY U.S. BONDS STAMPS

DETROIT TAP & TOOL CO.

8432 BUTLER
DETROIT 11,
MICH., U.S.A.

Tool Company's Board of Directors, according to S. J. Kornhauser, President. Desautels is also President of George O. Desautels Company, sales representative for National Tool. Desautels is technical consultant to Chief of Ordnance and member of the War Production Board.

Company Changes — Several important personnel changes are announced by the Norton Company: Fred L. Curtis has been appointed Manager of the Sales Engineering Department. He will report directly to General Sales Manager R. M. Johnson. Fred W. Grant will be Merchandising Engineer. He will be succeeded as Abrasive Engineer by Paul H. Carlson. E. C. Willey will succeed Carlson, who will move from the Moline, Illinois, territory to the Milwaukee.

Assistant Engineer—R. G. Wingerter, for six years Industrial Engineer for Timken Roller Bearing Company, has been named as Assistant Chief Engineer for the Industrial Division. Wingerter is a graduate of Wayne University.

Named Director— Fred A. Wyckoff now is Director of Appraisal and Cost Division, Norman E. Miller & Associates.

Works Manager—Robert L. Irvin has been named Works Manager of the Graham Plant of Pittsburgh Screw and Bolt Corporation. Announcement was made by John M. Yahres, Executive Vice President, who also reports that George H. Lee, Sr., who formerly headed the plant, will now devote his time to experimental and advisory work for all corporation plants.

General Manager—L. F. Weyand has been named General Manager of the Adhesive and Coatings Division, Minnesota Mining and Manufacturing Company. He has been General Sales Manager since 1936 and has been with the company 28 years. He will maintain offices in Detroit.

H. C. Kenyon will become General Sales Manager of Inland Rubber Corporation, 3-M subsidiary. An immediate program will be undertaken to sell vulcanizing equipment and tire patching materials to meet tire shortage problems.

Robert A. Russell

L. F. Weyand

Chief Planner — Ordnance Division, Bell Aircraft, reports elevation of Robert A. Russell to Chief Planning Engineer. Russell was formerly Assistant Chief Tool Designer. He has been associated with McKinney Tool & Manufacturing Company and the Weatherhead Company.

Aviation Manager—Air-minded Earl R. Southee has been appointed Aviation Section Manager for Hilliard Corporation. He was until recently Chief of the Standards Division and Assistant Director of the War Training Service of Civil Aeronautics Administration.

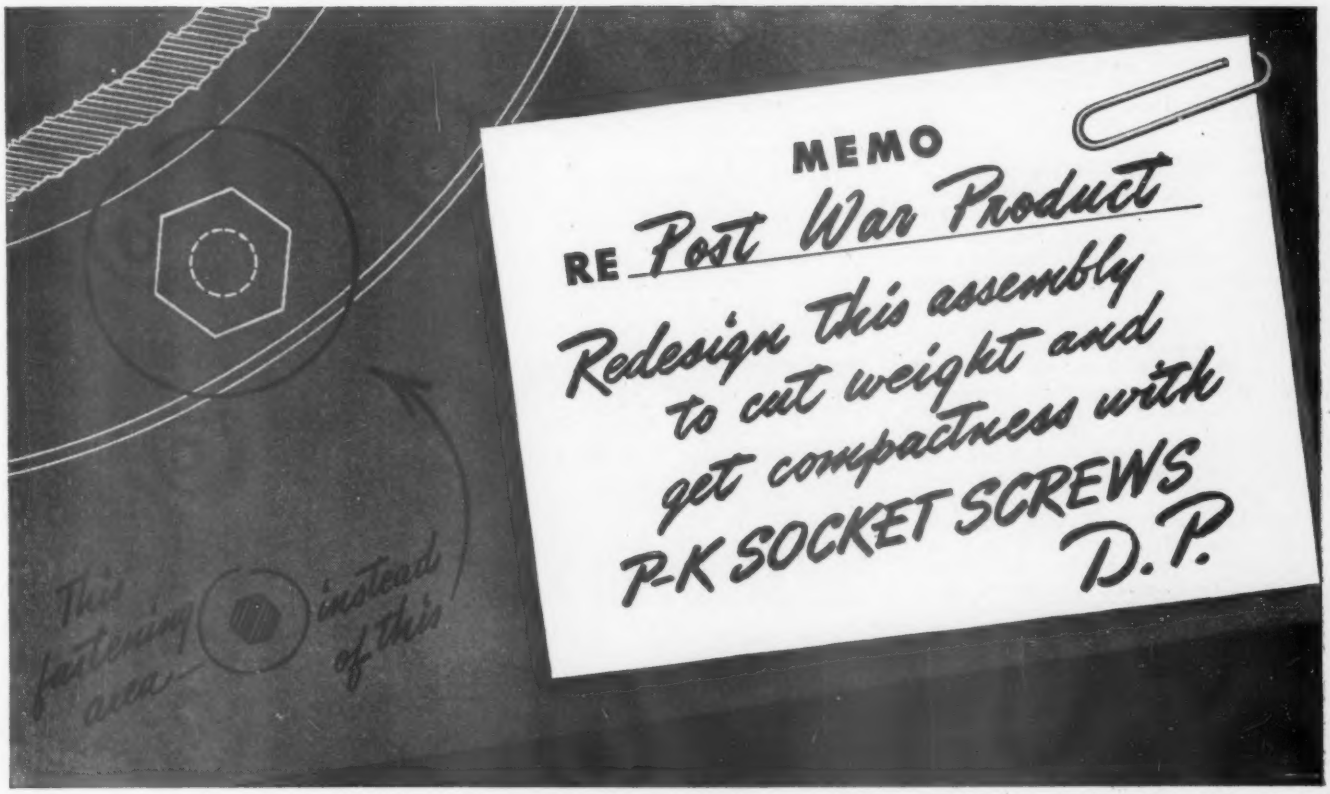
Turns Consultant—Frank F. Russell, General Manager, National Aircraft War Production Council, will direct the organization on a consulting basis, it is reported. He will devote part time to other interests.

New Engineer—Michael Pinto, formerly associated with Detroit Harvester Company, has been named Chief Engineer of the Caslin Company.

Branch Manager—Jessop Steel Company reports election of G. F. Golby as Manager of their Toronto Branch Office and Warehouse. He has been with the firm since 1925, and for 14 years with Crucible Steel Company. W. J. Henderson was appointed Manager of the Montreal Warehouse.

Assistant Manager— O. C. Tabbert has become Assistant Manager of P&H Welding Equipment Division,

(Continued on page 216)



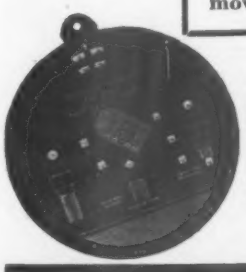
Because they compress abundant fastening strength into much less fastening space, P-K Socket Screws contribute to a more compact design, and allow substantial metal savings, wherever they can be used.

Look into these savings, and the other design advantages of P-K Socket Screws, while your post-war product is still on the drafting board. Have a P-K Assembly Engineer help you find the spots where they will save assembly time, lower costs, and improve construction.

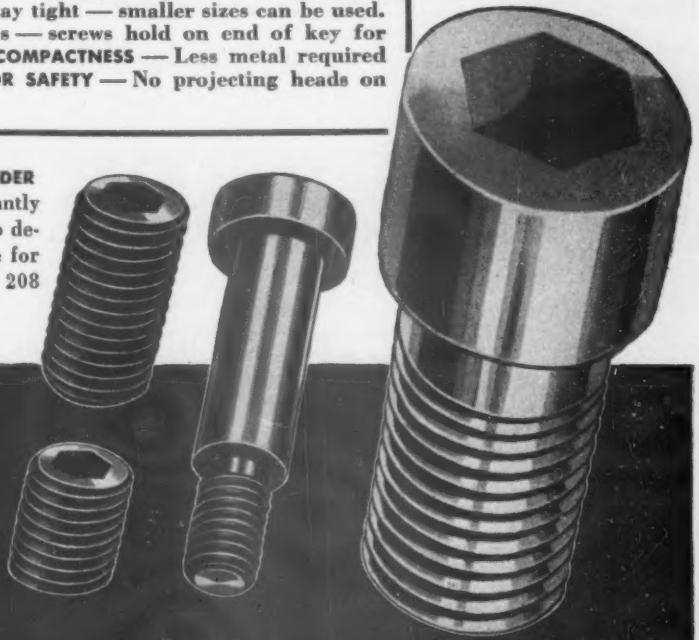
By specifying Parker-Kalon Socket Screws, you make certain of assemblies that can be trusted for strength and endurance. Unique P-K "Quality-Control" eliminates "doubtful" screws – screws that *look* right, but some of which might fail to *work* right.

PLAN with P-K SOCKET SCREWS –

FOR STRENGTH — Cold-forged of alloy steel, they withstand tremendous stresses. They can be set up tighter — stay tight — smaller sizes can be used. **FOR FASTER ASSEMBLY** — Key never slips — screws hold on end of key for placement in hard to reach spots. **FOR COMPACTNESS** — Less metal required in flanges or other fastening areas. **FOR SAFETY** — No projecting heads on moving parts.



FREE SOCKET SCREW DIMENSION FINDER
Gives you the information you need instantly – saves leafing through tables. FREE to designers, engineers, draftsmen . . . write for yours. Parker-Kalon Corporation, 208 Varick Street, New York 14, N. Y.



PARKER-KALON
Quality-Controlled
SOCKET SCREWS

A Product of PARKER-KALON--Specialists in Fastening Devices

Harnischfeger Corporation. Marvin H. Rutishauser continues as Manager. Tabbert was formerly Welding Engineer.

Director Resigns — Resignation of Henry F. du Pont from the General Motors Board has been accepted. Lammot du Pont Copeland, member Finance Committee of E. I. du Pont de Nemours & Company, has been named to succeed.

Public Relations—Election of M. W. Rowell, General Manager, National Tool & Die Manufacturers Association, to membership in the National Capital Forge and in the Associations Division of The American Public Relations Association has been announced.

Tool Serviceman — Advancement of Walter C. Lavers to Tool Serviceman and Representative at their Los Angeles Branch is announced by Kennametal Inc.

Branch Manager — James S. Rose leaves Curtiss-Wright to become Manager of a newly-opened Los Angeles office of Ilg Electric Ventilating Company. Ilg now has seven branches in the Pacific Division under management of C. E. Parks.

Official Resigns—Leo Edelson, Induction Heating Executive Vice President, has resigned that post to go to Metroloy Corporation of New Rochelle, N. Y., as President.

Vice Presidents—Edward G. Hardig has been promoted to Vice President in Charge of Sales and a director of National Tool Company, according to announcement of S. J. Kornhauser, President. Appointment of Douglas C. Albright as Vice President and Assistant to the President is also reported.

Curtiss-Wright—Appointment of E. J. Lyons as Director of Industrial Relations for the Airplane Division, Curtiss-Wright, is announced. He succeeds C. S. Mattoon, resigned. At the same time, appointment of George A. Snodgrass to succeed Lyons is reported. Lyons has been assistant to J. P. Davey, General Manager, Columbus Airplane Division plant. He is a former news man. Snodgrass, also a former news writer, has been administrative assistant. Mattoon resigned after 30 years of service with the company. Resignation was announced by Burdette S. Wright, Vice President.

E. G. Hardig

E. J. Lyons

Two Appointments — Allen-Bradley Company reports addition of two men to their staff. Frank D. Popowics, associated for many years with Colt's Patent Firearms Manufacturing Company, has been named a member of the sales engineering staff in New York. C. N. Calkins is district manager Charles M. McCoombs, formerly with the Bull Dog Electric Products Company, will be assistant to M. H. Hallenbeck, District Manager in Boston.

Merit Awards—For work in designing and manufacturing radar, two Westinghouse Electric employees have been honored with the Order of Merit. Frank E. Tighe, Superintendent of the Lansdowne, Md., plant and Forrest S. Mabry, Section Engineer, received the awards from A. W. Robertson, Chairman of the Board. Other Westinghouse personnel changes include: appointment of Richard M. Wilson as Manager of the Marine Division of the Government Office; B. P. Hess transferred to General Mill Section; C. C. Franck named as Manager of Land Turbine Engineering in the Steam Division; L. C. Fletcher became Steam Application Engineer; S. W. Schmidt is supervisor of subcontracting and J. R. Thomas will be superintendent of Fabricating and Welding.

Cherry Rivets—President William B. Hubbard, Cherry Rivet Company, announces appointment of resident representatives for New York City and

(Continued on page 218)

——PASSING PARADE——

Detroit. William M. Rosborough will serve the Detroit territory and Harold B. Thomas and P. J. St. James will handle New York.

Tool Salesman— Former Barber-Colman District Manager Chester S. Fischer has established himself in Chicago as Tool Sales Engineer.

Vice President—Donald B. MacAfee becomes Vice President in Charge of Sales for Bendmaster Manufacturing Company, according to Gerald Florence, President. Before the war MacAfee was in the Philippine Islands as President, Mechanical Supplies, Inc.

Research Professor—Illinois Institute of Technology announces through President Henry T. Heald appointment of William Goodman as Research Professor of refrigeration and air conditioning. Goodman was formerly consulting engineer for Trane Company and is author of a widely used text book, "Air Conditioning Analysis". He will begin duties in November. The appointment is one of a series being made by the institute as a part of its postwar development program.

Permanent Appointments—K. S. Ramey and J. R. Walker have been appointed permanently to management of California and Mid-Continent sales divisions respectively, according to General Sales Manager Alvin Zwerneman of Axelson Manufacturing Company. Both new appointees have been on temporary assignments to the posts.

Sales Engineer—R. L. Willis has been named Sales Engineer for TOCCO Process Induction Heating Division, Ohio Crankshaft Company, according to announcement of William E. Benninghoff, Manager.

Motor Division—Three appointments in General Electric's Motor Division are announced by W. H. Henry, Manager. D. A. Yates has been appointed Assistant Sales Manager, Lynn Motor Sales Group. Elliott Harrington is Sales Manager of the newly formed Integral-Horsepower, Alternating Current Motor Section. J. T. Farrell is Sales Manager, Integral-Horsepower, Direct Current Motor Section.

Chrysler Professor—Orlan M. Arnold, former chemistry professor at Rennselaer Polytechnic Institute, has joined Chrysler Corporation to set up a physical-chemistry research laboratory.

Steel Engineer—Climax Molybdenum Company announces appointment of M. M. Clark as Metallurgical Engineer for the Ohio District. Before joining Climax, Clark had been associated at different times with Carnegie-Illinois Steel Corporation, Central Alloy Steel Corporation and United Alloy Steel Corporation.

Consulting Engineer—Alexis J. Diakoff has left North Dakota University to be Consulting Engineer of Diesel Engine Department for American Locomotive Company.

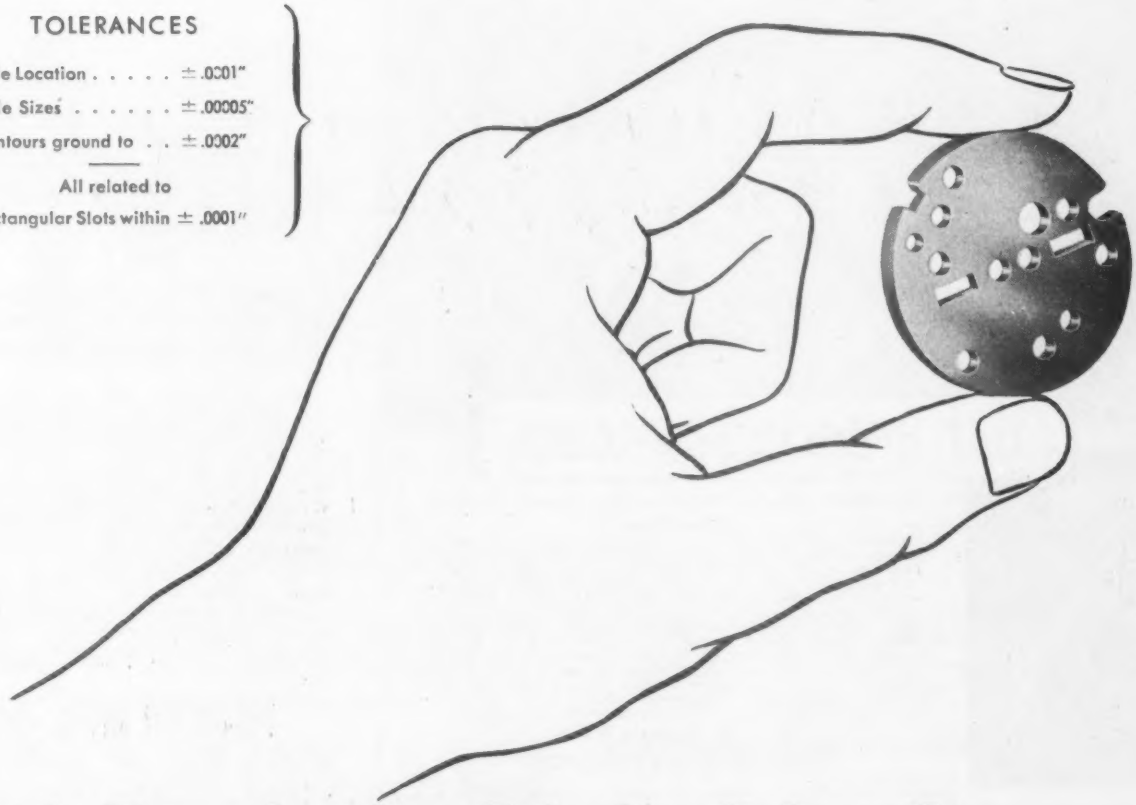
(Continued on page 120)

A Tough Hole-Grinding Job?

TOLERANCES

Hole Location . . . . . ±.0001"
Hole Sizes . . . . . ±.00005"
Contours ground to . . ±.0002"

All related to
Rectangular Slots within ± .0001"



Here's How the Jig Grinder Solves It

It's anybody's guess how long this intricate hole-grinding job would normally take, using the tedious toolmaker's buttons and locating-plug methods... especially to such tolerances. But it's no problem for the Moore Jig Grinder.

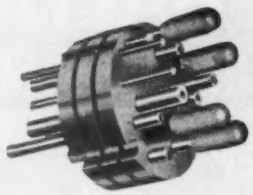
This unique machine precisely relocates holes and finish-grinds them within .0001". And then it checks its own work.

The master gage illustrated is one of many identical gages, each used by different manufacturers to determine the final production accuracy of a war-vital ordnance part. With the strictest interchangeability of parts called for—the burden of proof remains the gage's job. And, in turn, the accuracy of the gages depends on precision hole-grinding and finishing.

Toolmakers who measure their craftsmanship in strict tolerances find the Moore Jig Grinder the answer on all counts. You will, too.

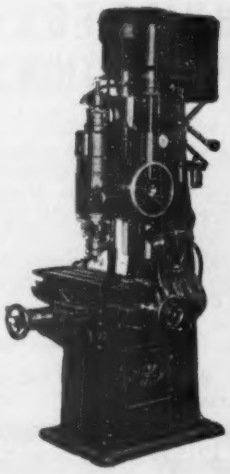
The Moore Jig Grinder has the capacity to grind holes from .030" to 4", provides .00005" per inch accuracy of lead screws and grinding speeds of 14,000 and 50,000 RPM.

May we send you a detailed bulletin on its application and ease of operation? There is no obligation, of course.



Proof of accuracy: Three individually ground master gages plugged together.

MOORE SPECIAL TOOL CO., INC.
732 UNION AVE., BRIDGEPORT 7, CONN.

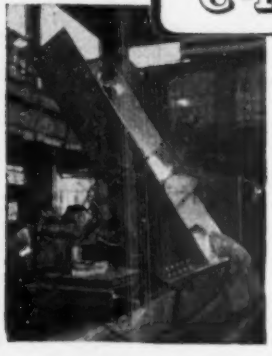


P. S. All the holes in the gages illustrated were bored on the Moore Jig Borer. With its built-in system of coordinate hole location the Moore Jig Borer enables the operator to spot, drill, bore and ream all *holes in a work piece with* minimum tool changes. *And its accuracy is held within .00025" in* any *position of the table. Investigate its advantages in your applications.*

Moore Jig Grinder

THE ONLY MACHINE OF ITS KIND

C-F POSITIONERS



"Position" Counts Most in this Heavy Welding Operation

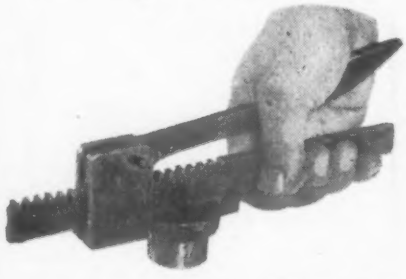
Production welding usually means working on top, bottom and on all sides of the weldment. It means a "quick change" of position should be possible for greater time saving, more efficiency, lower costs and greater safety to men and materials. With C-F positioners a welder can quickly position even the most cumbersome weldments at the press of a button, without crane help or handling crews. With just one set-up of the weldment he can position it easily, speedily and safely, all alone. He can rotate it a full 360° at variable speeds from 0 R.P.M. up, tilt it to 135° beyond horizontal, and can weld, down-hand, all sides, surfaces and angles in the one set-up with larger rods and fewer passes. All C-F positioners, both stationary and portable, are pedestal mounted to give maximum floor and working clearance and all are adjustable for height.

Write for Bulletin WP-22

CULLEN-FRIESTEDT CO.

1318 S. Kilbourn Ave. Chicago 23, Ill.

"STICKY" BUSHINGS *easily removed*



NEW TYPE HAND WRENCH FITS ALL SIZES OF SLIP BUSHINGS . . . STANDARD & MISCELLANEOUS

All slip bushings stick at some time or other, but with the handy PACKER bushing wrench you can quickly "lift" the stuck bushing from its socket without damage to bushing or socket. Designed to fit all sizes of slip bushings it puts an end to forcing and prying and eliminates accidental injury hazards. Easily carried in overall pocket, wrench may be put to hundreds of other uses as well. Used in better shops everywhere. Order yours today. Special discount on quantity lots.

$7.50 POSTPAID

PACKER MFG. CO.

GREEN BAY • WISCONSIN

BALDOR BALL BEARING GRINDERS

Guaranteed 1 Year

BUILT FOR HEAVY PRODUCTION SERVICE

BALDOR GRINDER No. 7106; ball-bearing, built for heavy-duty, precision grinding; equipped with Capacitor Type, ½ h.p. Motor; (110 volts, single phase, 3400 r.p.m.) WON'T BURN OUT. 7" x 1" wheels; large, adjustable, cast iron Tool Rests. Net weight 61 lbs. Fully Guaranteed for 1 yr. **$39.00**

***Ask for* Bulletin 319**

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4335 Duncan Ave., St. Louis 10, Mo.

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IMMEDIATE DELIVERY

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Acme, 9/16" Model C, 5 spdle, M.D.
Cleveland, 1, 1½, 2½, 2¾ & 3¾" Model A
Cleveland, ⅞, 1½ & 2" Model B
Cleveland, 1¼ & 1½" 4 spdle, Model M
Cone, 1¼" & 1½" 4 spdle, M.D.
Gridley, 2¼, 3¼ & 4¼" S.S.M.D.
Gridley, 9/16, ⅞ & 1¼" Model G, M.D.
Gridley, ¾, 1¼ & 2¼" Model F, M.D.
Potter & Johnston, No. 5A & 6A M.D.

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Barber-Colman No. 12 Hobbers
Fellows Shapers, No. 6 & No. 7 H.S.

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Landis 6 x 18 & 10 x 36" Landis Plain, M.D.
6" x 32" Norton Plain, M.D.
Parsons-Arter, R.S. 12" Mag. Chuck, M.D.
Pratt & Whitney No. 14 Surface, M.D.
Webster & Perks, 10" x 30" Universal

LATHES

American, 12" x 6' Geared Head, M.D.
Hendy, 12" x 5 & 6' Geared H'd, M.D.
Warner & Swasey Turret No. 2 & 4 M.D.
Warner & Swasey Turret No. 5 Geared Head

MILLING MACHINES

Becker Vertical No. 5 & 6—Model C
Becker Vertical, Model SD, 40" Rotary Table
Brown & Sharpe No. 1½ Plain, M.D.
Milwaukee No. 1½B Plain, M.D.

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DANLY PRECISION DIE SETS

—PASSING PARADE—

Company Changes—F. Jerome Tone, Jr. has been named Vice President in Charge of Sales for the Carborundum Company, according to announcement of President Arthur Batts. Tone has been in charge of Eastern Sales Division. Vice President Henry P. Kirchner has been named to be in Charge of Production and Otis Hutchins will be Technical Director. Hutchins will be in charge of research, process control and development.

Deaths

John M. Stahr, 60, Comptroller of Manufacture, Westinghouse Electric Company, died August 15 on vacation at Lake Minnewaska, N. Y.

George Alexander Hughes, 71, inventor of the electric stove, died in September. He was Chairman of Edison General Electric Company at time of his death.

Earl A. Banister, 55, President, Merritt-Chapman & Scott Company, died late in August in New York. The company supervised salvaging of the liner Normandy.

J. A. Schermerhorn, 37, Works Manager, American Welding Company, died early in August at Carbondale, Penna.

Dwight L. Armstrong, 50, died in September in Lancaster, Penna. He had been a vice president of Armstrong Cork Company.

(Concluded on page 224)

SCORE

GRINDING 50
MILLING 10

* Another test run won by CORTLAND CHUCKS and SEGMENTS

Here is an unusual Cortland War Production Test Run . . . not against competitive chucks and segments, but against the production time of *milling*.

TEST FACTS: The gun mount division of a great war producer . . . using a Blanchard No. 18 Vertical Surface Grinder . . . Wheel Speed, 750 R.P.M.

WORK: Bearing caps . . . Drop Forgings . . . 50 pieces per table load.

PURPOSE: The purpose of this test was to determine if Cortland Chucks and Segments could grind off .193 stock faster than it could be removed by milling. It had taken 2 minutes per piece in milling.

RESULTS OF TEST: *Cortland Segments mounted in Cortland Chuck ground 50 pieces in 19-1/2 minutes! That's boosting production five times!*

Much of your milling work may be ground . . . perhaps at greater speed and lower cost . . . certainly with required accuracy—when you use Cortland Chucks and Segments. Why not call in a Cortland Grinding Engineer to discuss the matter . . . or write for latest illustrated bulletin, giving complete details of Cortland Chuck and Segment performance.

CORTLAND GRINDING WHEELS CORP.
14 Cortland Street Chester, Massachusetts

Diagonal Shearing with Varying Contact Means Better Surface Grinding

A true segment, the grinding surface has narrow ends that *start* the work with minimum shock and resistance. Straight inner edge of segment passes diagonally across work with a *shearing* action that *cuts* and *removes* the metal. Varying contact area insures longer exposure to coolant—decreases heat—reduces segment wear—conserves power.

CORTLAND
Chucks and Segments

CLASSIFIED ADVERTISING

(Concluded from page 222)

SITUATIONS AVAILABLE

DIRECTOR
Design for Production

Key position with leading manufacturer refrigeration and air conditioning equipment. Directing group responsible for evolving production-worthy designs in cooperation with development engineers, responsible for functional design and manufacturing engineers responsible for production. Liaison between manufacturing and development on all matters involving mechanical design of our products. Requires thorough knowledge factory engineering, including machining, tooling, sheetmetal and foundry work, plus administrative ability. Excellent postwar opportunity. Box E46. The TOOL ENGINEER.

• • •

WANTED

Man to coordinate sales and manufacture of Tungsten Carbide and Cast Alloy Division of nationally prominent tool steel manufacturer. Position requires executive ability, experience in sales and familiarity with selling prices of carbide specialties and cast alloy tools, as well as ability to supervise production. Salary open. In answering give complete background. All replies held in confidence. Box 842, The TOOL ENGINEER.

• • •

WANTED

Tool Engineer by Middle West manufacturer of small parts for automotive and other mechanized equipment. Progressive organization, in business since 1850; employs 1400 people. Permanent postwar position. State age, education, experience and draft status. Must comply with WMC regulations. Reply Box 843, The TOOL ENGINEER.

• • •

BRANCH MANAGER WANTED

Nationally known manufacturer of die sets and die makers' supplies needs a man with sales experience to manage local office and perform necessary sales duties in the metropolitan New York City territory. Applicant should have good knowledge of territory from actual experience. In writing give brief resume of previous experience, present connection. Write Box 837, The TOOL ENGINEER.

SALES ENGINEER
Location — Ohio

Progressive engineering and tool manufacturing concern of 25 years standing is seeking a qualified tool designer who is, by virtue of experience, capable of heading up engineering sales, covering complete service in tool design, process engineering, production planning, plant lay-out, etc. We have an engineering organization of approximately 60 men and our manufacturing facilities are balanced in a manner to permit handling of all types of work. This combination enables us to manufacture all tools and equipment we design, if customer so desires. This is a first class job for a high caliber man and offers unlimited postwar possibilities. Straight salary, or salary and commission. Give complete chronological record and all pertinent facts in your letter. Address Box 836, The TOOL ENGINEER.

Superintendent of thread grinding department wanted by Mid-Western concern making tools and gages. Should have sound experienced background together with satisfactory supervisory qualifications. Write in detail. Box 838, The TOOL ENGINEER.

• • •

Nationally known manufacturer of reamers and cutting tools has opening for representative in St. Louis and surrounding territory on protected commission basis for man with engineering and mechanical background now selling allied lines to manufacturers in that area. Address reply to Box 840, The TOOL ENGINEER.

• • •

CHIEF ENGINEER
★Postwar Opportunity

Long-established, financially sound manufacturer wood pencils, mechanical pencils, fountain pens, allied products in New York area requires competent engineer to organize and supervise product engineering; process and methods; tool, die and special machine design; development, tryout and improvement of equipment; tool and machine shop operation. Preferably man with shop experience who has worked as designer of tools and special machinery. No conversion problem. Write giving complete data on experience, education, availability, compensation. Confidence will be respected. Box 841, The TOOL ENGINEER.

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TOO LATE TO CLASSIFY

Practical production & mechanical engineer, 35 years supervision experience available shortly. Seeks postwar connection Detroit Area. Write Box 845, The TOOL ENGINEER.

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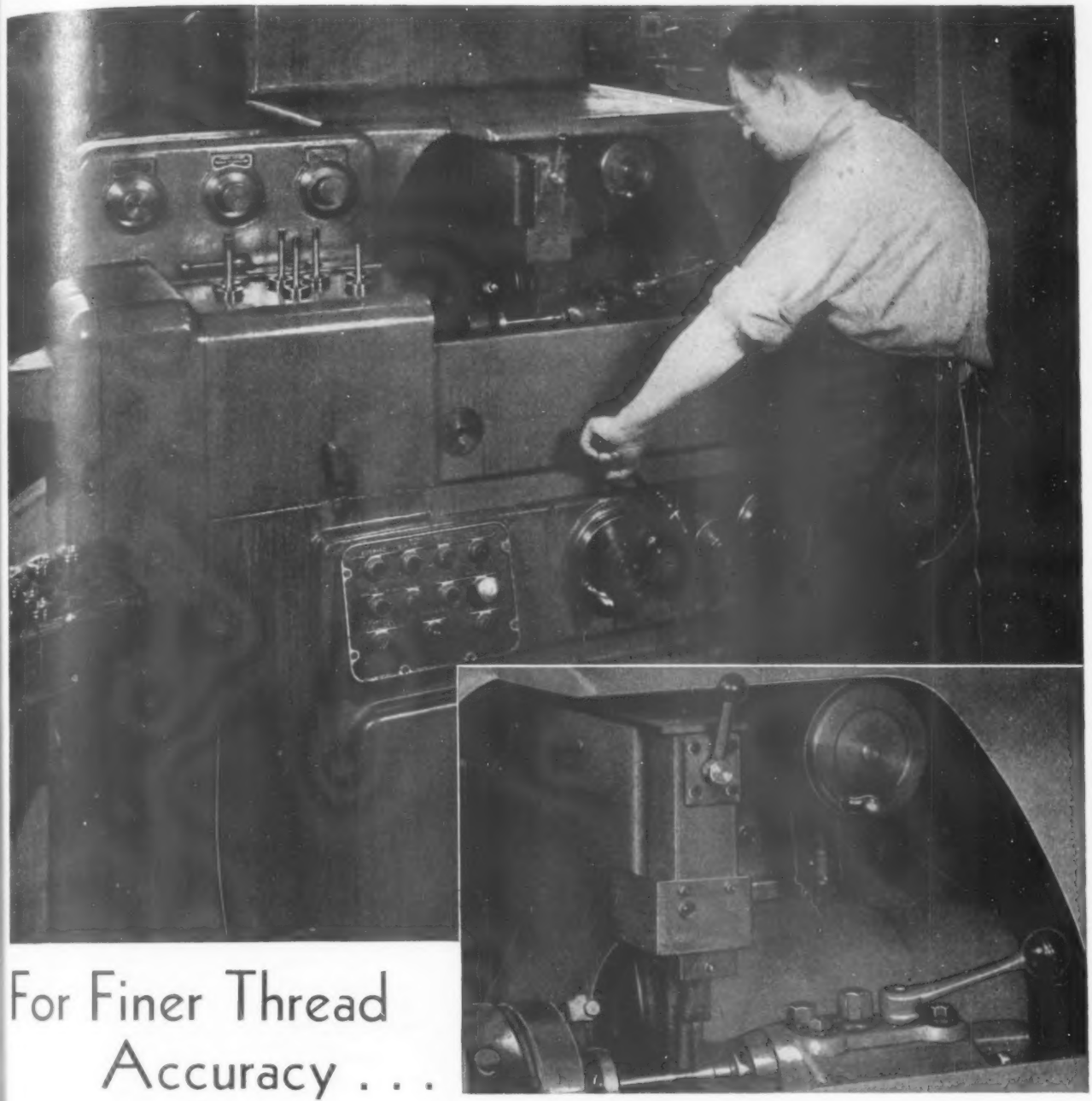


For Finer Thread Accuracy . . .

LANDIS PRECISION THREAD GRINDER

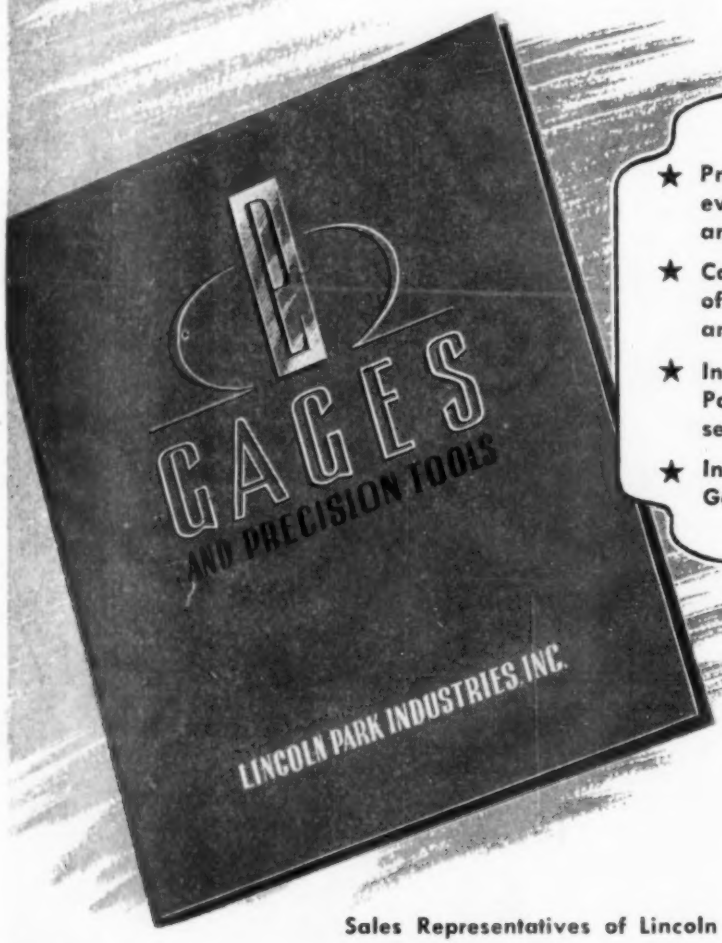
The LANDIS Precision Thread Grinder is a precisely built machine tool, developed especially for grinding threads of extreme accuracy. Many manufacturers depend on their LANDIS Thread Grinder for the finer thread accuracy of aircraft and automotive components that must be produced to extremely close tolerances.

The illustration shows a LANDIS Precision Thread Grinder in the Mid-Western plant of a leading aircraft engine manufacturer, grinding valve stems for aircraft engines. These valves are used not only on new plant assembled engines, but as replacement parts in A.A.F. bases throughout the world.

Write for Bulletin E-93

LANDIS MACHINE COMPANY, WAYNESBORO, PENNA, U.S.A.

A NEW, *Completely Revised Catalog* OF LINCOLN PARK PRODUCTS



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Successor to The Lincoln Park Tool and Gage Company and Carbur, Inc.

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1 We have been building lathes since 1887.

2 LeBlond Lathes today are used on turning operations the world over.

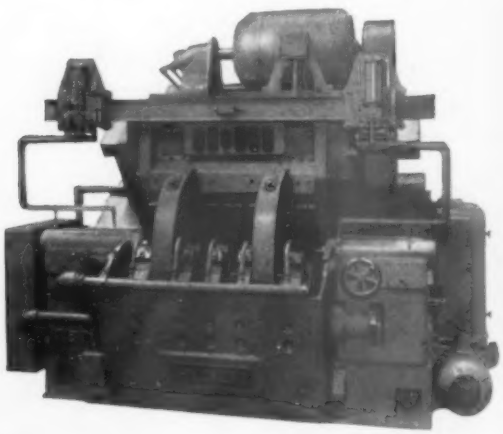
3 The accumulated knowledge of every manufacturing trend in good times and bad—peace and war, gained from thousands of installations is now available to you.

4 Our field engineers are at your service—ready to help you in your development work for the postwar era—particularly along the lines of the difficult, out-of-the-ordinary turning problems.

5 This service is yours for the asking. Contact our nearest dealer or write—

LeBLOND 1-LB CRANKSHAFT LINE BEARING LATHE

ROUGH AND FINISH LINE BEARINGS IN ONE OPERATION



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